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Electrical World

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Contents of This Issue

EDITORIALS 923

BENEFITS OBTAINED FROM ELECTRIC HEAT-TREATMENT.926

Annealing, carburizing, hardening and drawing in automatic electric furnaces speed up production in Detroit automobile plants. Heat-treating costs reduced and quality improved.

ARC WELDING APPLIED TO CRANE CONSTRUCTION.....934

INCREASING THE VALUE OF SCRAP CABLE.....935

By N. S. Hinman

CELLULOID MODEL OF EXPERIMENTAL ARCH DAM AIDS TESTS 936

TESTS OF HINGED CROSSARMS.....937

Indicate effectiveness of this simple development in tower design for saving steel and still preventing torsional failure of towers when wind or sleet breaks conductors.

80 PER CENT BOILER EFFICIENCY WITH LOW PLANT FACTOR 940

By Lawrence Washington and H. W. Meyer

CONCRETE STRUCTURE SERVES TRIPLE PURPOSE.....941

KITCHEN ON WHEELS INTRODUCES ELECTRIC RANGE....942

By H. W. Ewald

THE ELECTRICAL INDUSTRY AND THE CONTEMPLATED FEDERAL INVESTIGATION 942

ALLOCATION OF CAPACITY COSTS IN PRACTICE.....943

By Arthur H. Ford

Consumption and demand method used by Iowa utility in rate to forty towns. Majority of customers choose this rate where option is available. Rate results in smooth curve.

NEW ELECTROLYTIC PROCESS FOR ZINC PRODUCTION.....944

OPEN THE DOOR TO LARGER SALES.....945

By Norman T. Wilcox

The "district representative" plan and its application. How sales of appliances and energy have increased by its uses. Public relations improved as business grows.

FINDS WAGE EARNERS ARE GOOD APPLIANCE PROSPECTS 947

AUTOMATIC HYDRO HOLDS LAKE LEVEL.....948

SELLING STREET LIGHTING.....949

LETTERS FROM OUR READERS.....950

DIGEST OF ELECTRICAL LITERATURE.....951

NEWS OF THE INDUSTRY.....953

COURT DECISIONS, COMMISSION RULINGS.....961
NEWS ABOUT MEN OF THE INDUSTRY.....962
FINANCIAL AND STATISTICAL.....964
BUSINESS NEWS AND MARKET CONDITIONS.....968
ACTIVITIES OF THE TRADE.....970
NEW EQUIPMENT AVAILABLE.....971
ELECTRICAL PATENTS 972

BUSINESS FACTS FOR ELECTRICAL MEN.....973

During Office Hours

THE monthly publication of the local electric association in one of our larger cities exhorts the members to profit from the valuable articles and suggestions that are contained in the technical press. A list of magazines received by the association is given and the statement is made that especially worth-while material is clipped and filed. The duty of reading these magazines before they are clipped devolves on the staff of the association. The number of publications is so large, however, that all of them cannot always be read, since the reading must be done outside of office hours. But there is one exception:

"It might interest our readers to know that the only publication that is read during office hours is the ELECTRICAL WORLD. The rest of them have to be read in outside spare time."

Evidence that the ELECTRICAL WORLD is an integral part of the electrical industry: it is read during office hours.

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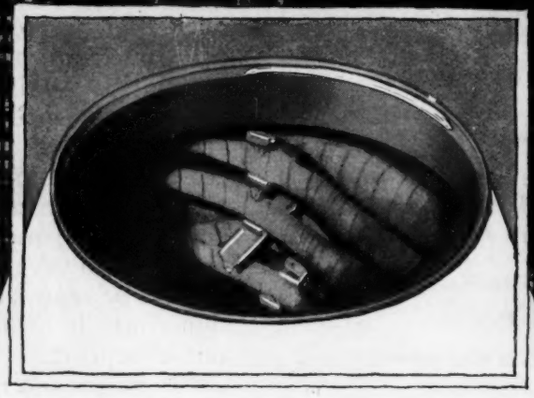

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Electrical World

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Editor

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Electric Heating an Educational Job for the Electrical Industry

ELECTRIC heat treatment of metal parts, whereby two Detroit automobile plants have speeded up or increased production capacity and effected other manufacturing economies and advantages, is discussed in this issue of the ELECTRICAL WORLD. These installations represent but two of many similar instances in which the automotive industry has been quick to seize upon electric heating equipment as best meeting this vital need in the fabrication of the present-day automobile. This recognition of the value of electric heating processes exemplifies the spirit and quick intelligence of the automobile manufacturers, and their experience can be of inestimable value to other industries. There is probably not a metal-treating manufacturer in the country who could not profitably install electric furnaces for some one or all of his heat-treating processes. Many, however, have little or no information as to what electric heating can accomplish for them. Some have not the courage that the automobile industry has shown to go ahead with what appears to be a revolutionary change. Many others have yet to be convinced of what the electric furnace can do.

There is a great deal of education yet to be done in demonstrating the economic value of industrial electric heating processes, and here is a task that is up to the electrical industry as a whole. It affects not only the furnace manufacturer and the power company, but every other manufacturer of electrical equipment, including generating, transmission, distribution, metering, wiring, control and other apparatus down to the insulators which support the heating elements in the furnace. The 3,170-kw. heat-treating department in one of the Detroit automobile plants referred to meant the expenditure of nearly a third of a million dollars in electrical apparatus over and above the cost of the furnaces themselves. There are a good many more millions of kilowatts of industrial heating load waiting to be sold.

* * * *

The Investor's Confidence Is Worth Holding

AT THEIR recent national conventions both the Investment Bankers' Association of America and the American Bankers' Association took cognizance of the investment trust movement, a relatively new development in this country. Both emphasized the magnitude and importance of the new institution. They made suggestions as to how the movement should be safeguarded —how it should avoid menacing pitfalls. A phase of the subject that does not seem to have been brought out is that these institutions, with their increasingly accurate and rigid methods of investigation, are setting up certain investment standards which those connected with the issue and sale of securities—either the companies themselves or their bankers—cannot afford to overlook. Collectively they are becoming a factor in the investment field.

Along with other large investors such as the insurance group, investment companies are no longer satisfied merely with an analysis of balance sheets, earning records and operating efficiency. They are making a rigid study of such factors as banking profits and price of issue in relation to the market. Their highly developed statistical and research departments keep a careful record of behavior of a company's previous issues, ascertaining such facts, for example, as whether ultimate holders have been careful or indiscriminate investors. They put in their "black books," for example, a company whose 5 per cent long-term mortgage bonds, handled by a banking house closely allied to the company itself, are sold in an active market, say at two points above par, callable in a year at 105 and less thereafter—an alleged long-term investment which ceases to be long-term without due compensation to the lender.

Of course, there is little to worry the issuer of securities in the present market. Conditions such as those now existing, however, are not necessarily permanent, and to disregard the interest of the investor is short-sighted. The big investors, such as the insurance companies and the investment trusts, collectively, are becoming more and more critical and, incidentally, are assuming an important rôle as a guide to investors at large.

* * * *

Commissions View Holding-Company Operations with Suspicion

IN VIEW of the admitted economies which follow the co-ordination and consolidation of electric generating and transmitting facilities there is not much popular opposition to holding companies as such. Most people have come to see that all the biggest and best of our electric light and power systems are now made up of companies originally under very many ownerships, none of which as an independent and separate entity could render a service comparable with that which all of them give as part of a single system. And yet, in spite of all these advantages and the admitted superiority of the service rendered because of them, holding companies are viewed with suspicion by many of the public service commissions of the country. This suspicion in many cases is based on experience with promoters who have an eye to quick financial gains over and above those made possible by large-scale operation and greater specialization in labor, machinery and production processes.

For a time it was thought that only the newer and less

seasoned of the holding-company operators were guilty of paying exorbitant prices for properties of doubtful value and earning capacity, and heaven knows they have certainly discovered ways and means of making fortunes out of junk; but commissions in such states as New York, Maryland, Indiana and Wisconsin, to mention a few, complain of attempted infractions by many old-line operators. They find fault, not with the service nor yet with the rates, but with attempts at inflated capitalization. Two large and reputable holding-company operators were taken to task recently by the Wisconsin commission over the financial aspects of consolidations under the commission's jurisdiction, and the operators bowed to the commission. Morally as well as legally holding companies should show adequate value behind their issues; but inasmuch as state commissions have no right to investigate holding-company operations, the only scrutiny many issues receive is that given by the bankers. Obviously, other indorsement is also desirable if public as well as commission suspicion is to be allayed, and the disposition shown by some holding companies to open their books to commissions on every phase of their operations which affects the rates and expenses of subsidiaries is commendable. Certainly holding companies would fare better under state than under federal regulation, if regulation comes.

* * * *

Impressive Personnel for Industry Sales Conference

FOUR presidents of manufacturing companies and one vice-president will represent the National Electrical Manufacturers' Association in the coming industry sales conference. Three vice-presidents and two prominent sales executives will speak for the National Electric Light Association. Three presidents, one vice-president and one general manager compose the delegation for the Electrical Supply Jobbers' Association. The Association of Electragists is sending the well-known heads of five contracting companies. The league group numbers the chairman and vice-chairman of the League Council and three outstanding leaders of successful local leagues. This personnel, just announced, is probably the most distinguished that has ever been appointed to a joint committee for the furtherance of any industry purpose.

These gentlemen will come together in New York on Nov. 21 to consider first the underwired condition of the sixteen million homes now connected to the power systems of America. It is to be hoped that they will suggest a broad embracive sales program for the development of this great market upon which the entire industry may concentrate. The Society for Electrical Development has also appointed representatives in the persons of the presidents of the N.E.L.A., N.E.M.A., E.S.J.A., A.E.I. and League Council and the chairman of its own executive committee. However, inasmuch as these men are the official heads of the very organizations that have sent the five delegations to form the conference, and therefore will be called upon to review and approve any resulting program, and since they themselves are now the executive officers of the reorganized S.E.D., to whose directorate such a program will be referred before this new council of the industry will take action, it is doubtful if this S.E.D. delegation will do more than advise and observe. Essentially this is to be a conference of the four major branches, each so vitally concerned.

The problem now so squarely before the industry can no longer go begging. The inadequacy of the wiring in virtually all the homes that use electricity at all stands a barrier to the sale of appliances and the consumption of energy. Moreover, now that the number of houses wired is dwindling each year, this rewiring opportunity offers the market of most immediate promise for the sale of wiring materials, fixtures, small motors and all the meters, transformers and other equipment that will be needed to carry the load. The coming conference can render a great service to the entire industry by studying into the fundamentals of its broad market problem, finding the pathway forward and leading the movement.

* * * *

Our Diplomatic Flying Squadron

THROUGHOUT human history misunderstandings have thrived upon delayed communication. Each forward step in facilitating instant transmission of ideas between nations has helped to cut down friction, and so the inauguration of telephone service between continental United States and Mexico will contribute to world peace and better relations. Our friends of the Bell system work on a grand scale in these times, and the outposts of the communication engineer's advancing front bid fair to enter every land and clime as the years pass. What a tribute to research, private ownership, initiative and organization transcontinental, transatlantic and international telephony exhibit! A specialized industry with its own refined technique, yes; but one founded upon science and engineering working hand in hand for the common good. Surely the electrons of the communication company, be it telegraphic, radio or telephonic in name, are invisible ambassadors of understanding and good will, flying to overcome the handicaps of space between men and serving civilization with superb efficiency.

* * * *

Bringing Light Out of Darkness

ONE of the most interesting features of the electric light and power business is the rapidity with which new and almost revolutionary developments become assimilated in the working routine and remain as essential features of regular service. A few weeks ago members of the Association of Edison Illuminating Companies gathered in Colorado Springs for the annual meeting of that organization. As a feature of diverting interest, objects in the garden of the Broadmoor Hotel were treated with a special coating or paint and subjected to the rays of ultra-violet light coming from invisible sources. The statues and benches are reported to have appeared self-luminous in a pale glow. The effect was not only unusual but exceeded in scale any laboratory efforts of this nature. This novelty may soon be a commercial factor of no small importance, for an auditorium in an Eastern city may be equipped with apparatus designed to give effect to a modification of the plan. The soft, diffused lighting that is needed when the main system has been turned off is to emanate from stars and representations of other heavenly bodies on or near the ceiling. This will be done through the illumination of small, treated areas by concealed ultra-violet wave sources which will cause the numerous areas to glow.

Yesterday's toy or laboratory novelty, today's di-

version, tomorrow's utility. It is the story of the romance and fascination of one of the industries exciting the greatest influence on this generation. Samuel Ferguson recently recalled to memory a discussion at an Edison Illuminating Association meeting many years ago in which the dangers, perils and cumulative weakness involved in the contemplated use of alternating current were pointed out. It is not possible to foresee the outcome of the contemporary lighting effort referred to above. It would be equally futile to say that today's standards of illumination and sources are final or even, in the ultimate sense, satisfactory.

* * * *

Progress in Cable Research

MANUFACTURERS, operating engineers, research workers and all others interested in the perennial problem of the performance and life of high-voltage underground cables will read with interest the study of the mechanism of cable failure presented at the recent Colorado meeting of the Association of Edison Illuminating Companies by the research department of the Detroit Edison Company. It is "old stuff" to comment on the eternal presence of this problem, but it has never been so acute as at the present time. The constant trend to higher voltages and the increasing demand for higher capacity occasioned by the increasing density of service are stressing more than ever the importance of reliability of service and of the enormous annual cost resulting from cable failures.

Cable engineers will therefore read with relief that the Detroit Edison Company has made a careful survey of the situation and has decided that those who have been working at this problem have been so far unsuccessful because of lack of breadth of vision and knowledge and because of failure to extend their studies back to the first principles. Common sense is what is needed, that company holds, and the proper path for solution of the problem is to survey all of the principal causes that have been suggested for cable failure, to study each one of them separately from its fundamental origin, and so by processes of elimination and combination to arrive at the cause. The Detroit Edison Company has set for itself no less ambitious a program than this survey and series of studies. Although announcing that its present contribution is only a progress report, it feels that its superstudy has advanced so far as to warrant the announcement of the probable cause of cable failure. Briefly stated, it is the chemical action resulting from the ionization of air or gas spaces in the cable. The condition favorable to the beginning of this process is occasioned either by improper impregnation or by mechanical strains arising in installation or in subsequent contraction and expansion under load. It is apparently assumed that gas spaces are inherent in the very nature of impregnated paper and that the ultimate remedy is to find an impregnating compound which will stand up without the liberation of gas in the presence of the ionization arising in air or gas pockets.

It will be a relief to cable manufacturers to have their problem narrowed in this definite way, although some of them may have heard the suggestions before and may already be turning their thoughts to the particular trouble suggested. One might even find among them some doubters, whose confidence in the findings is shaken by the somewhat incomplete analysis of the problems arising in the electrical characteristics of the materials involved. For example, the question of dielectric absorption and its relation to dielectric loss and the important dependent matter of temperature rise are dismissed as being of relatively small importance and too obscure for a common-sense plan of attack. Research engineers and physicists may also take exception to the pictures that are drawn of the ultimate nature of the various types of conductivity in composite dielectrics.

The problem of dielectric behavior has engaged the attention of physicists for many years; indeed, it would appear at present that for some time past the physicists have given up the problem of the anomalous behavior of dielectrics in favor of the greater interest of the question of the structure of the atom. The attack upon the problem of dielectrics has, however, been taken up in recent years with increasing energy by all of the agencies of the electrical industries, which in their turn have also convinced various national and other scientific bodies of its importance. A problem which has been too difficult for the physicists to solve will scarcely yield to a program of attack based only on common sense, for, after all, common sense is only another expression for average human knowledge. Average human knowledge is not sufficient for the problems of the high-voltage cable. Its solution will not come suddenly nor from a single source, but it will arrive as the result of extensive and united efforts of research, manufacturing and operating engineers. The Detroit Edison Company is an additional valued participant in this problem.

* * * *

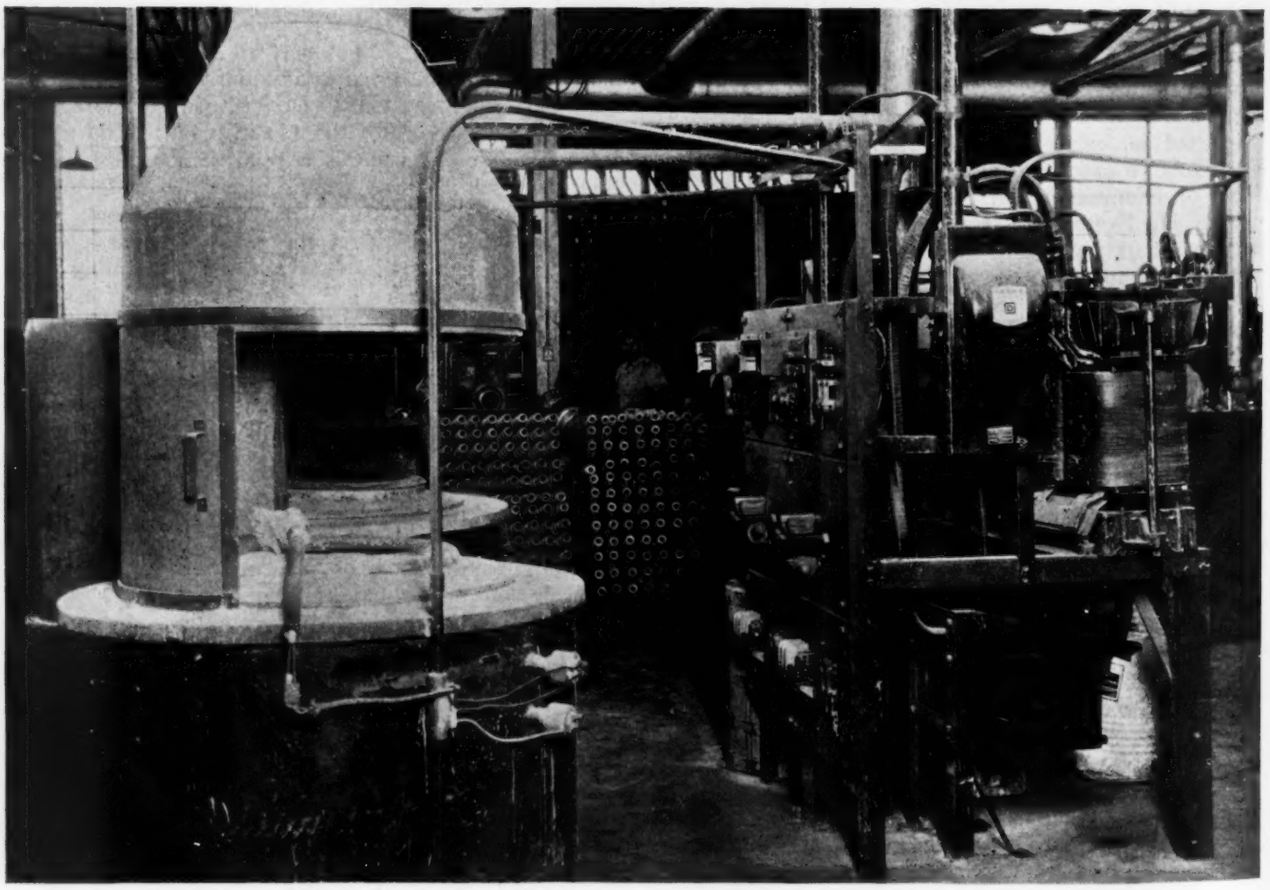
Stable Systems Essential

IN THE development of the large power system it is important that service standards be increased and not decreased. This necessitates the building of a system which is stable despite a fault at any place or of any magnitude. Service cannot be discontinued under any circumstances, and, if possible, all units in the system should be kept loaded to maximum values in order to insure maximum economy. Designs of large systems are based on two schools of thought in regard to these matters. One school believes a solid structure should be built in which all units operate in parallel under normal conditions and all troubles are eliminated only when they develop severity. Another school designs a system on the "loose-linking" basis wherein generating units and transmission lines are operated more or less as a group of small systems with arrangements for switching to insure flexibility and continuity of service. As an operating principle these systems are sectionalized in many places, and if a fault occurs, it is the practice to remove the faulty section instantly.

Local conditions, historical developments, duration of operating experience and other elements influence the designers of these systems. The state of the art as regards the perfection of apparatus for handling the operating requirements of the two types of systems is not complete. Nor have any of the systems been in operation under load and area conditions which fulfill the expectations for the extensive power systems contemplated in the near future. As a result an honest difference of opinion exists as to their relative merits and only time can give the answer. Fortunately, the answer will make little difference in the installations, for loose links can be made solid links with ease and the contrary also is true. It is good for the art that both schools of thought exist and that advocates of the respective systems are enthusiastic over their designs.

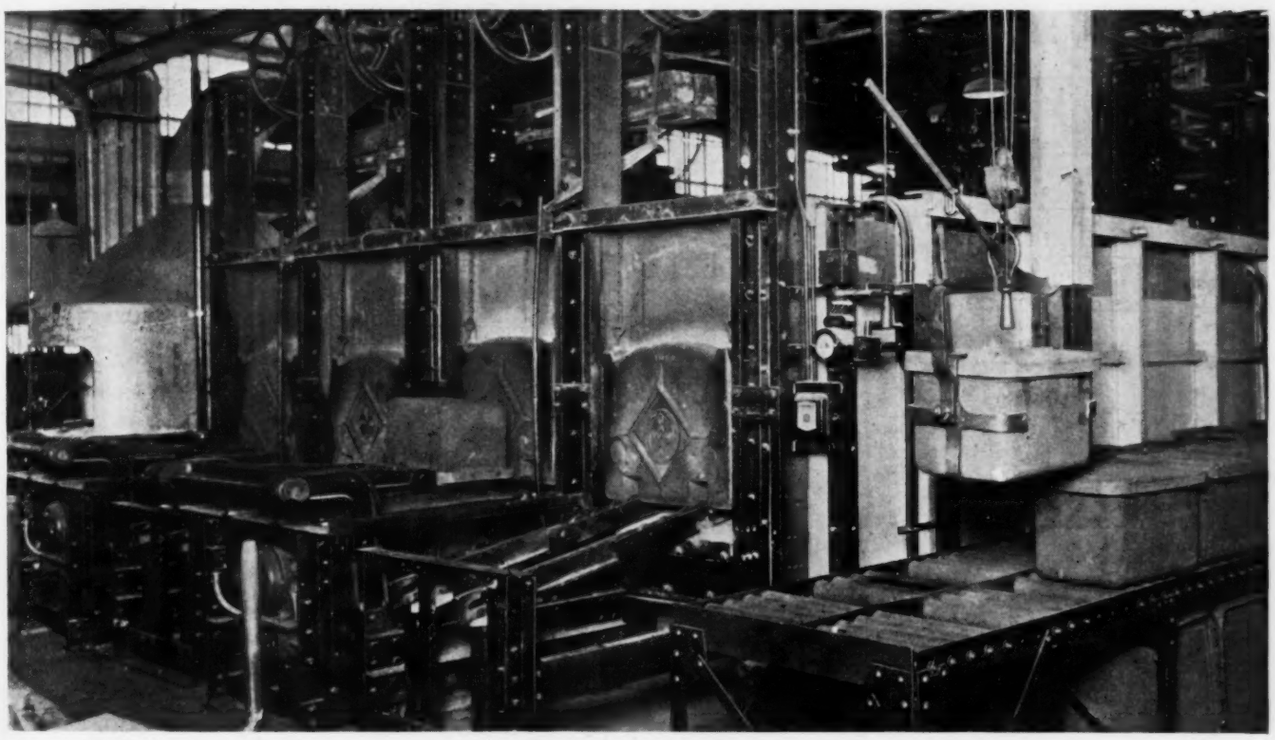
Processes, Not Industries, Determine Field for Heat Applications

ELECTRIC annealing, carburizing, hardening, drawing, etc., have been found advantageous by automobile and parts manufacturers, as evidence on the following pages indicates. The surprising situation is that many concerns have apparently failed to recognize that there is also a field for these applications among other factories and even in small shops. Any place where heat is used for industrial processes affords an opportunity to consider the advantages of electricity. If a careful study shows that it is more desirable for the user to employ some other source of heat, it is not to the electric light and power companies' advantage to urge electricity. Whatever is best for the customer is best for every one in the long run. But there are many processes which need study and which can be electrified with mutual profit.



Benefits Obtained from
Electric Heat-Treatment

Annealing, carburizing, hardening and drawing in automatic electric furnaces speed up production in Detroit automobile plants. Heat-treating costs reduced and quality improved



360-KW. HAGAN ELECTRIC CARBURIZING FURNACE IN PRODUCTION LINE AT GEMMER MANUFACTURING COMPANY'S PLANT

UNINTERRUPTED production of increasingly higher quality automobiles at minimum over-all manufacturing costs is a paramount consideration in the automotive industry today. It depends very largely upon a continuous supply of uniform material and parts that go into the assembly of the finished car. Virtually all of the steel sheets, castings and forgings used in the fabrication of automobiles must receive one or more processes of heat-treating and frequently the heat-treating department is the neck of the bottle through which all production must pass. If parts come out of the heat-treat unevenly annealed, it means the cutting speeds of machine tools must be changed to meet each varying condition of metal. If parts are warped or sprung because of underheating or overheating, or too rapid cooling, they must be rejected. If parts fail to come out on schedule, other operations are slowed up and sometimes are halted entirely. Any one or all of these conditions result in increased costs, lower production, curtailment of machinists' and other workmen's profitable time and perhaps a substandard grade of car.

The illustrations on this and the opposite page show heat applications in the production line at the Gemmer Manufacturing Company's plant. At the top of page 926 are two 175-kw. Hagan rotary heat-treating furnaces for hardening and drawing. Below are two 30-kw. Electric Furnace Company's cyanide pots and the control board. This electric heating equipment, by being located directly in the production line of the machine shop, saves floor space and time and cost of trucking. Note the entire absence of smoke and fumes in all these illustrations. Men are able to work around these furnaces without the least discomfort from heat or obnoxious gases.

Production managers in automobile plants are finding the solution of many heat-treating problems in the adoption of electric furnaces for these most important steps in manufacture. The design, construction and operation of the electric heating equipment used in two plants making exclusive gears, axles and steering gears for automobiles are typical of the trend in the automotive industry toward complete electrification of plants. Both of these plants are located in Detroit and are supplied with power by the Detroit Edison Company.

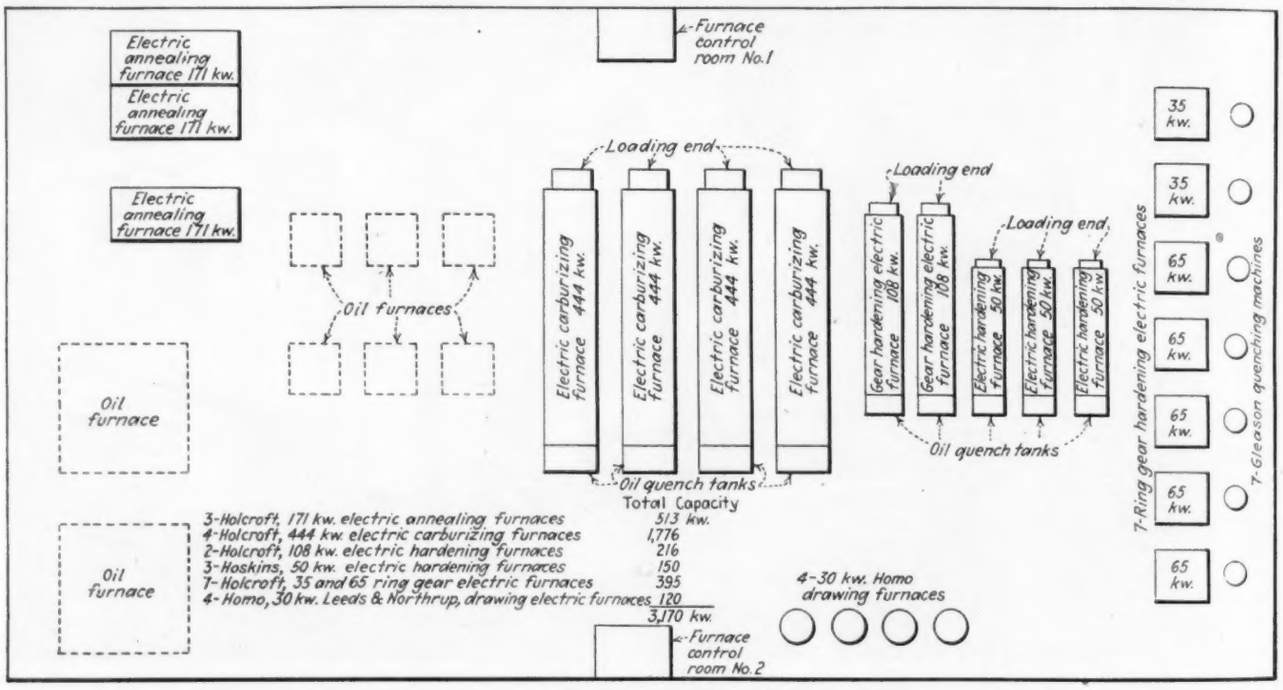
At the Gemmer Manufacturing Company, which makes steering gear equipment used on many well-known pleasure cars, heat-treating operations are carried on with electric furnaces located directly in the production line in the machine shop. The electric heating equipment

consists of one pusher-type, counter-flow carburizing furnace and two automatic rotary furnaces designed and built by the George J. Hagan Company. Also in use are six Electric Furnace Company 30-kw. cyanide pots. A 60-kw. japanning oven completes the present electric heating equipment. All of this apparatus is installed in the machine shop, adjacent to machine tool and assembly operations. This arrangement has been possible only because, with the electric furnaces, atmospheric conditions in the plant are not affected. There is a complete absence of fumes, smoke or heat, the presence of which often makes it disagreeable or impossible for men to work in the vicinity of fuel-fired furnaces.

The carburizing furnace that is used to carbonize steering gear parts measures approximately 44 ft. long by 19 ft. wide by 7 ft. from floor to top of steel work.

The advantage of having individual heating chambers is that each row of boxes going through the furnace can be treated, as far as temperature is concerned, without any reference to the adjoining row or rows when varying temperatures are required for carburizing parts requiring different case depths. Likewise, the individual chambers and the wall separating the furnace into two equal sections permit operation of the furnace at 50 per cent capacity, and if no regeneration is desired, one chamber may be run by itself.

The heating elements consist of 80/20 nickel-chrome rolled-ribbon resistors suspended away from the walls of the furnace by special wall-mounted refractory insulators of very rugged design. These insulators have only knife edge contact with the heating element. It has been found that for a given furnace temperature this type of in-


Furnace control room No.1
Electric annealing furnace 171 kw.
Electric annealing furnace 171 kw.
Electric annealing furnace 171 kw.
Loading end
Electric carburizing furnace 444 kw.
Electric carburizing furnace 444 kw.
Electric carburizing furnace 444 kw.
Electric carburizing furnace 444 kw.
Oil furnaces
Oil furnace
Oil furnace
Oil quench tanks
Loading end
Gear hardening electric furnace 108 kw.
Gear hardening electric furnace 108 kw.
Loading end
Electric hardening furnace 50 kw.
Electric hardening furnace 50 kw.
Electric hardening furnace 50 kw.
Oil quench tanks
35 kw.
35 kw.
65 kw.
65 kw.
65 kw.
65 kw.
65 kw.
7-Ring gear hardening electric furnaces
7-Gleason quenching machines
Total Capacity
3-Holcroft, 171 kw. electric annealing furnaces 513 kw.
4-Holcroft, 444 kw. electric carburizing furnaces 1,776
2-Holcroft, 108 kw. electric hardening furnaces 216
3-Hoskins, 50 kw. electric hardening furnaces 150
7-Holcroft, 35 and 65 ring gear electric furnaces 395
4-Homo, 30 kw. Leeds & Northrup, drawing electric furnaces 120
3,170 kw.
4-30 kw. Homo drawing furnaces
Furnace control room No.2

LAYOUT OF ELECTRIC FURNACE EQUIPMENT IN THE HEAT-TREATING DEPARTMENT OF AN AUTOMOBILE GEAR AND AXLE PLANT

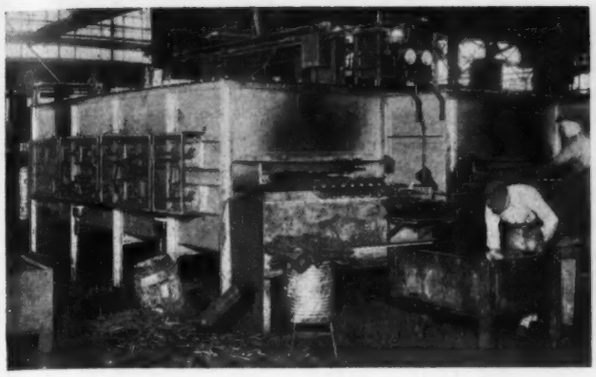
A wall extends the full length of the furnace, dividing it into two equal sections, each consisting of two heating chambers in the center and one cooling and preheating chamber at each end. Alloy rollers are provided upon which inverted carburizing boxes travel. The walls and arches of the furnace are built up with fireclay brick, insulated with 12½ in. of heat-insulating brick. The entire structure is encased in steel plates on the two sides and bottom and cast-iron members at each end of the furnace.

The heating equipment consists of a total of 360 kw. designed for operation on 220-volt, three-phase, 60-cycle power service. This entire load is divided into eight control circuits, two control circuits per heating chamber. The heating elements are mounted on the side wall and on the hearth of each heating chamber. Splitting the control circuit in each heating chamber into two circuits permits the operation of the entrance end of the furnace at a temperature entirely independent of the ultimate soaking temperature desired at the exit end of each chamber. This relation may be maintained automatically by correlating the rate of travel of the boxes and the heating up or entrance end temperature.

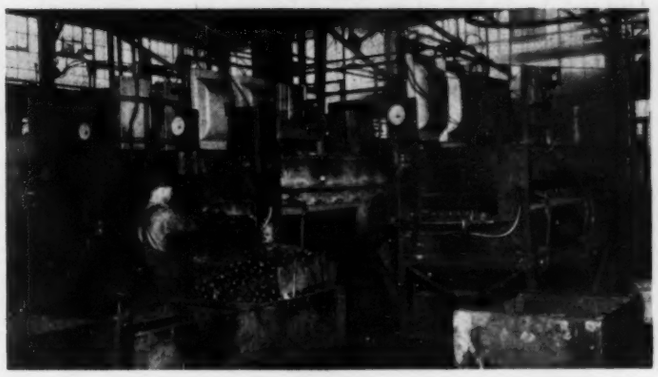
sulator permits a decrease in actual ribbon temperature of more than 100 deg. F.

Each of the two heating circuits in each heating chamber is connected to a standard General Electric automatic control panel consisting of a main-line contactor, an auxiliary relay or contactor, an operating relay and an overload relay, all mounted on an ebony-asbestos base. In each heating chamber are two thermocouples and two temperature-limit fuses, one thermocouple and one fuse being connected in each circuit. The temperature-limit fuse is connected in series with the operating-relay coil. Each thermocouple is connected to a Leeds & Northrup recording regulator of the potentiometer type, which in turn actuates the operating relay.

The carbonizing boxes in which the material is packed in carburizing compound measure outside 15 in. wide by 22 in long by 13½ in. high. These boxes are loaded and packed at one side of the furnace. The gross weight of an average box, including box, compound, parts and cover, is 401½ lb. The furnace accommodates 30 boxes per row. The gross production per hour for the furnace is 2,680 lb., and the net production per hour is 1,752 lb. The operating or soaking temperature is 1,650 deg. F.



CHARGING ENDS OF HOLCROFT 108-KW. GEAR-HARDENING ELECTRIC FURNACES



THREE HOSKINS 50-KW. FURNACES WHICH ARE USED FOR HARDENING METAL PARTS

The temperature maintained at the incoming end of each heating chamber is 1,700 deg. F. The boxes are in the preheating chamber five hours, in the heating and soaking chamber eight hours and in the cooling chamber five hours, the total cycle being eighteen hours for a 0.040-in. "case."

The furnace, when turning out this production, operates on a 36-minute cycle, which means that in eighteen hours it will turn out a total of 120 boxes, or in 24 hours a total of 160 boxes. There is one pusher for each row, two pushers being located at one end of the furnace and two at the opposite end. The pushing mechanism consists of a crosshead operated intermittently by a 3-hp. constant-speed motor connected to the crosshead by means of a Link-Belt silent-chain drive, a Foote Brothers worm-gear speed reducer, a pinion, a spur gear, a drive shaft and a connecting rod. The driving motor control consists of a Stromberg automatic repeating-type process instrument, two relays and a Cutler-Hammer across-the-line type starter with thermal overload relay protection and normally closed push-button station. This entire mechanism is interlocked with a specially designed rotary switch, so that each of the operations takes place in its proper sequence. Provision is also made for stopping and starting the motors by push-button stations. There are four motor-operated pushers, each separately controlled by the equipment just described. In addition to this, the motor-operated pusher equipment is so interconnected with the doors that when a pusher in a given row starts in motion, the furnace doors at each end of the row rise automatically and remain in this position until one box has been charged and another box discharged. At this time both doors are closed automatically by means of this motor-driven pusher equipment. At the discharge end of each row the rails and rollers are so designed that when a box reaches a position just inside of the discharge door, the box overbalances itself and rolls by gravity out of the furnace to a position where it is clear and free of the furnace door. A set of gravity conveyors at each end of the furnace permits the rolling of the box around to the side of the furnace, where it is unloaded and repacked for subsequent heating.

Operating Cycle

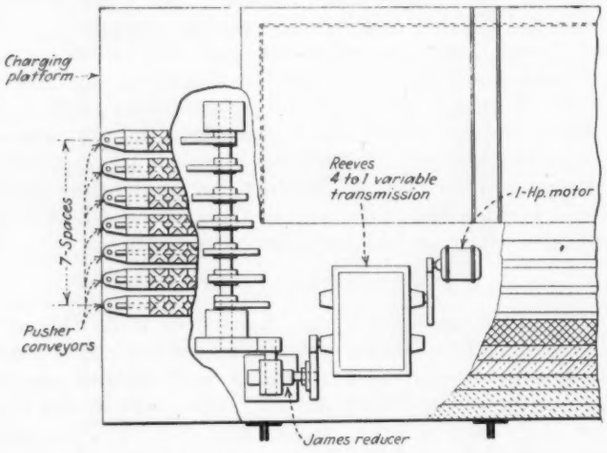
A typical operating cycle of one row is as follows: The automatic repeating process instrument comes back to zero at the end of a 36-minute interval and sets in motion the motor-driven charger, both doors in this one row are raised, a box is pushed into the furnace at the same time that a box is pushed out of it, both doors close and the motor stops. The process instrument in the meantime has reset itself at the 36-minute station and starts working back toward zero, at which time this operation is repeated. The same cycle applies to each of the four rows in the furnace.

This carburizing operation was previously carried on in box-type batch-type furnaces heated with fuel, but it was impossible to get satisfactory results continuously

THREE 171-KW. HOLCROFT COMPENSATING PUSHER-TYPE ELECTRIC ANNEALING FURNACES. THE THREE FURNACES ARE OPERATED BY TWO MEN

without depending upon skilled labor. It was frequently necessary to take test pieces out of a furnace charge to determine whether or not the charge had secured its proper "case" depth. In mass or batch carbonizing, such as was previously used, results varied widely, because of the fact that the boxes were placed over a considerable furnace hearth area. In the new equipment the results, once established, are repeated continuously and automatically with a minimum of labor, which is called on to perform only such manual operations as are incidental to a carburizing operation. It is not necessary to sample parts to see if the proper "case" depth has been secured, as treatment of a given charge operating on a given time and temperature cycle will produce identical results without variation.

The system is a progressive one. Of more importance, from a production standpoint, is the fact that the entire equipment is situated in the immediate vicinity of the machines on which previous and succeeding operations are carried on. This naturally eliminates a great deal



PLAN OF PUSHER-TYPE ELECTRIC HARDENING FURNACE

of trucking, waste floor space and time between the heat-treating department and the machining department. In this particular plant the furnaces are located in the middle of the machining and grinding equipment and no attempt is made to isolate the heat-treating and carburizing equipment from the mechanical part of the manufacturing process.

Electric Hardening and Drawing

The two Hagan automatic rotary furnaces, one used for hardening and the other for drawing steel castings, are exact duplicates. The over-all diameter of each of these furnaces is approximately 12½ ft.; the height to the top of the furnace is about 6 ft.

The furnace consists essentially of an annular heating chamber sealed at the bottom by means of an annular rotating table. The furnace has two doors located adjacent to each other, one door being used for charging material into the furnace and the other as a trouble or inspection door. A baffle wall separates the two doors so that the cold incoming work will not chill the material that has been heated and is ready to be quenched.

The rotating hearth is supported on and rotates on a ball thrust bearing. The hearth is driven by a constant-speed alternating-current motor through gear-reducing mechanism. A Stromberg automatic process instrument, operating through Cutler-Hammer relays and contactors, advances the hearth intermittently, continuously and automatically. The time clock permits any desired time interval between movements from fifteen seconds to six minutes in steps of fifteen seconds each. With this arrangement the heating time can be set at any desired value between five minutes minimum and two hours maximum and the heating for all settings is positive and definite.

Mounted on the annular rotating hearth are a total of twenty segment-shaped cast-alloy trays hinged so as to move in a vertical plane on an axle tangential to the outer circumference of the furnace. An alloy chute below the discharge door conveys the material to a quench tank located immediately adjacent to the furnace.

The discharge mechanism is operated from the top of the furnace. The hearth movement and the discharge movement are interconnected by interlock switches so that each movement is controlled by the one preceding. Control switches keep the discharging mechanism at rest while the furnace rotates, as in warming up.

To prevent air leakage into the furnace chamber through the clearance space between the rotating hearth and the furnace walls, annular sand seals are provided at both the outer and the inner periphery of the hearth structure. The charging door is automatically opened in synchronism with the movement of the hearth and remains open until after the charging is complete, when it is closed by means of a foot treadle. The door at the discharge position is arranged for hand operation. The entire furnace is supported above the floor proper by cast-iron legs. The width of the hearth is 24 in. and the effective hearth area is 35 sq.ft.

The electric heating equipment consists of 80/20 nickel-chrome rolled-ribbon resistors suspended away from the side walls by special refractory hanger brick. The capacity of the heating equipment is 175 kw. for operation on 220-volt, three-phase, 60-cycle power service. In order to provide for refinement in temperature control, the windings are divided into two control zones, each provided with its independent control panel and instrument. With this control equipment and the arrangement of the thermocouples near the discharge door, and a thermocouple located half way around the heating chamber, a very flexible control is obtained.

The operating cycle of the furnace is as follows: The automatic repeating process instrument comes back to zero at the end of its interval and sets in motion the discharging device, which lifts the inner edge of one tray and discharges material away from the outer circumference of the tray into a chute and from this to the quench tank. The tray is lowered into its normal position on the furnace hearth. The charging door opens and a cold charge is placed in one of the trays directly in front of it and the door is then manually closed. The hearth remains at rest until the selected time interval has again elapsed (determined by the automatic process instrument); at that time the hearth is started up and advanced one station, when the operations just described occur again automatically. This applies to both of the furnaces.

Hardening Gear Parts

The first furnace is used for hardening the steering gear parts and is operated at a temperature of 1,625 deg. F. The materials are discharged directly from the furnace into a quench tank. In the second furnace the temperature is set at 1,200 deg. F., and the materials are discharged into a quench tank, from which, however,

the quenching medium has been removed. The two furnaces are arranged in the same straight line as regards the quench tanks. As the materials come out of the quench tank from the hardening furnace they are in a position to be directly charged into the draw furnace. As they come out of the quench tank from the draw furnace they are deposited in the tote boxes so that they may be easily taken to another place in the plant for succeeding operations.

Under operating conditions the hardening furnace, working at a temperature of 1,625 deg. F., turns out a total of 1,700 lb. of material per hour with an energy consumption of 152 kw.-hr. No figures are available on the power consumption of the draw furnace, but operating at 1,200 deg. F., it uses considerably less.

The outstanding advantages of the electric carburizing, annealing and hardening furnaces used in this plant may be listed as follows:

Individual heat-treatment of parts under positive automatic control of time and temperature cycles, resulting in ability to duplicate results continuously and automatically independently of the furnace operator.

Sealing the discharge end of the hardening furnace and discharging the material directly into the quench tank cut down oxidation losses and maintain a constant positive atmosphere in the furnace. The automatic discharging feature eliminates one-half of the work that a furnace operator is ordinarily called upon to do as all that he has to take care of is the charging of material into the furnace. Ordinarily he is called on to discharge the material as well. It is possible to operate two of these furnaces with only one attendant.

The double system of control used in both types of furnace permits a rapid rate of heating up, independently of the soaking or holding temperature. It also eliminates the possibilty of overheating the work prior to its introduction into the soaking zone.

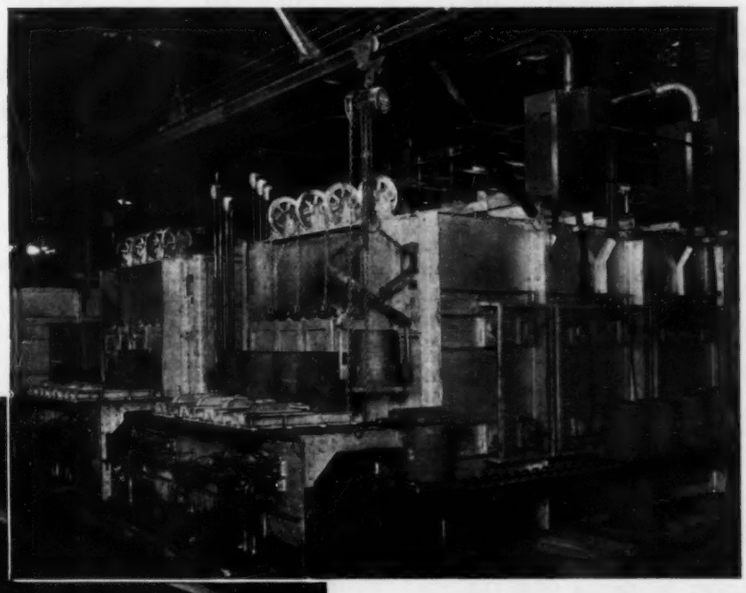
With this type of equipment it is possible to eliminate all of the heating variables existing in any heat-treating operation, and in addition to this, the labor costs have been cut in half.

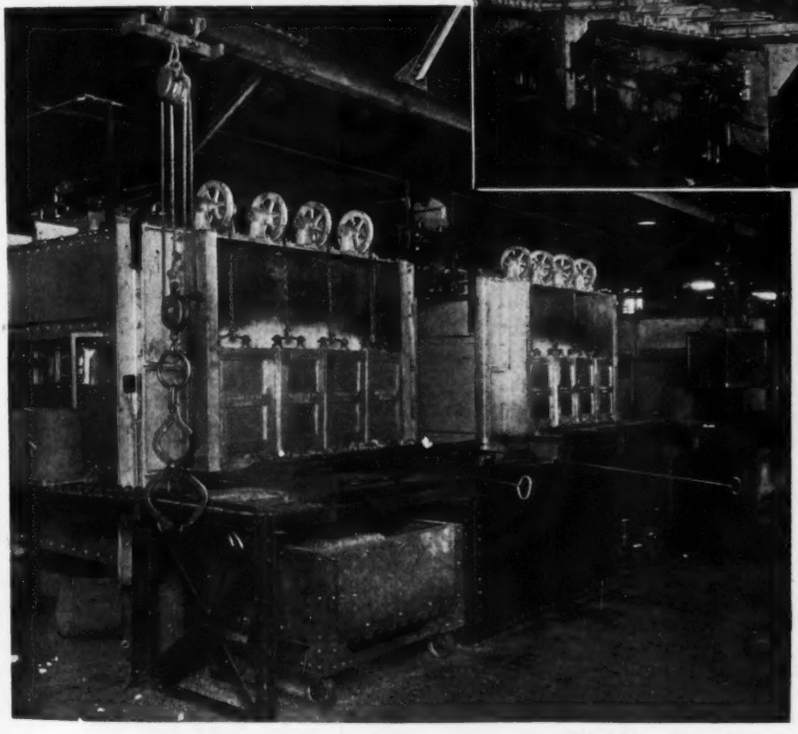
In the carburizing furnace individual heating chambers permit carrying on individual treatment in each row and also permit the operation of the furnace in an economical manner during varying production periods such as are frequent in the automotive industry.

The equipment is situated directly in the machine line-up, saving rehandling, trucking and floor space.

Working conditions are improved, since there are no fumes or gases to contend with other than those given off by the carburizing compound itself.

The use of electric furnaces has been responsible for improvement in power conditions in the plant itself and has also assisted in earning a better unit power rate for the entire plant load. Power factor conditions, when considered on an average basis, have been considerably improved in this plant, due to the fact that there are many small motors used in other operations.





Battery of Four 444-kw. Holcroft Electric Furnaces for Carburizing Gears and Axle Parts

The charging end of the furnace is shown in the top view.

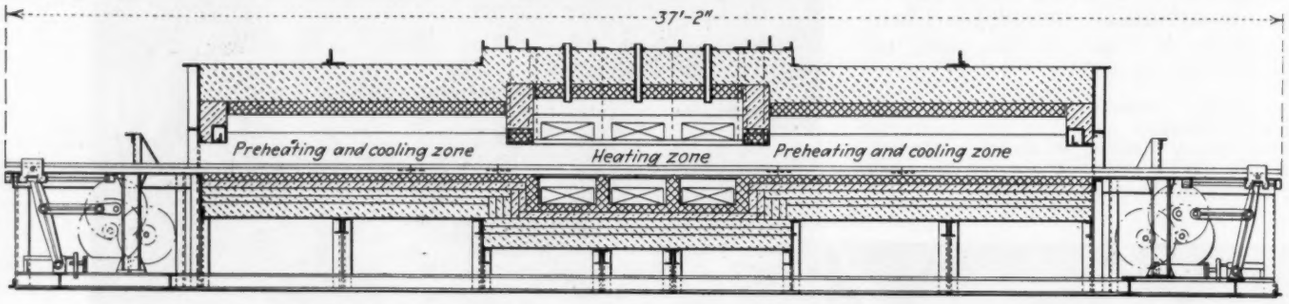
At left is the discharge end of the furnace and quench tanks.

The loading platform and actuating mechanism for pushers are illustrated above.

One of the best examples of how the benefits experienced with electric heating in a single small installation led to an installation of large proportions is found in the gear and axle plant of another of Detroit's automobile factories. Starting two years ago with an initial installation of one 35-kw. furnace for hardening ring gears, the electric heating equipment has grown to a total of 3,170 kw. in hardening, annealing, carburizing and drawing furnaces. The heat-treating department of this plant is now about 70 per cent electrical and the remaining fuel-fired furnaces will be replaced with the electric type.

The diagram on page 928 shows the general layout of this heat-treating department, which has in operation the following electric heating equipment: Seven Holcroft ring-gear hardening furnaces, three Hoskins hardening furnaces, three Holcroft annealing furnaces, four Holcroft carburizing furnaces, two Holcroft hardening furnaces and four Leeds & Northrup Homo drawing furnaces.

The ring-gear hardening furnace is an unusual and interesting development in electric furnace design. It is a vertical pusher type for hardening after carburizing. It is 4 ft. 7 in. square and 8 ft. high. Six bars of Nichrome steel fastened at the top and bottom of the heating chamber guide the gears in their vertical passage through the furnace. These bars are surrounded by a non-inductive spiral-wound heating unit. The cylindrical heating chamber is surrounded by a calcined block casing 4½ in. thick and additional insulating material



ARRANGEMENT OF THE PREHEATING, COOLING AND HEATING ZONES OF COMPENSATING PUSHER-TYPE ELECTRIC ANNEALING FURNACE

10½ in. thick. The outside case is of ¼-in. steel plate with angle construction. Free access is had to the heating chamber by means of a removable cover at the top of the furnace. Of the seven furnaces of this type in use, two are rated at 35 kw. and five at 65 kw.

The output of the furnace is between 55 and 60 gears, or about 600 lb. of work, per hour, or 10 lb. per kilowatt-hour. Single-phase, 220-volt current stepped down from 440 volts is used. Temperature is controlled by a Leeds & Northrup single-point controller, and signal lights are provided at the side of each furnace—a purple light indicating proper temperature and a red light too high temperature.

Operation of the furnace, aside from feeding the gears into and removing them from the furnace, is automatic. The gears move through the furnace in vertical stacks. The mechanism consists of a slide under the hearth at the side of the furnace and a plunger, which raises the gear into position at the bottom of the stack. When the gear is raised, it is held in place by three latches around the circumference of the gear and the plunger returns for another gear. The slide that carries the work to a point directly above the plunger is operated by a cam and gear. The mechanism is driven by a 1-hp. motor through two speed-reducing units.

The furnace has one attendant, who feeds the gears into the slide at the bottom and removes them from the top of the stack through a small door operated by a foot lever. The furnace holds 60 gears and its rated output is 60 per hour, or one per minute. The operating temperature is 1,500 deg. F. It takes twenty minutes for the work to come up to heat, and it is kept at soaking heat 40 minutes. When the attendant takes the gear from the furnace, it is placed in the die of a Gleason quenching machine, after which it is placed on a rack to allow the oil to drain off.

On a man-hour basis the output of 60 gears per man per hour compares with the production of 45 gears per man per hour with the box-type fuel-fired furnaces formerly used. There has been a 50 per cent saving in floor space, and production in this process has been increased in the ratio of two to one. Estimates made in the heat-treating department show that there has been a 20 per cent saving in labor cost per unit and no increase in heating cost, but a probable reduction. Because of the even temperature, gears come out with an even hardness and are generally better. There is virtually no scale, no sandblasting is required and very little brushing is necessary; this results in considerable saving in cleaning compared with the former method. There is scarcely any rejection for warp, a condition that was very serious in the box-type furnace and the principal reason for adopting electric furnaces. The human element has been nearly eliminated through the automatic features. Since smoke, fumes and heat have been almost entirely done away with, working conditions have been improved and a better class of labor is attracted.

Three Annealing Furnaces Operated by Two Men

Located at the opposite end of the heat-treating department are three annealing furnaces used for normalizing ring gears, pinions, differential gears and yokes—in fact, all forged parts that go to make up the axle assembly. These furnaces are of the compensating pusher type, and an interesting feature is that work enters and is discharged from each end. Four conveyors travel through the furnace, two moving in each direction. The heating zone is located in the center of the furnace, and in this zone heating units having a connected load of 171 kw. are installed. At each end of this zone is a preheating and cooling chamber, where the hot work passing out of the furnace gives up heat to the cold work going in. Thus about 50 per cent of the heat is reclaimed.

Each furnace is 26 ft. long and the heating chamber is 5 ft. 3 in. wide and 1 ft. high. The work is pushed through on trays made of nickel-chromium alloy; the total time in the furnace is approximately 4½ hours, about 50 minutes of this time being in the heating zone at a temperature of 1,650 deg. F. and the remainder in the preheating and cooling zones.

Energy is supplied at 440 volts, 60 cycle, three-phase, and the temperature of the furnaces is automatically controlled by Leeds & Northrup controlling and recording instruments. The drive mechanism consists of a 2-hp. motor operating a worm-type speed reducer and a Reeves transmission at each end. Pusher arms operated by cams are connected to pusher blocks on the loading table which extend out 6 ft. from each end of the furnace. When a block is drawn back, it leaves space for placing

another pan between the block and the first loading pan. Only two attendants are required to operate the three furnaces. One man at each end loads the ingoing work and unloads the outgoing work, this being done by hand.

A week's test run on these furnaces operating 24 hours per day showed an economy of approximately 20 lb. gross per kilowatt-hour, which included the carriers. Excluding these, the net economy was 14 lb. of steel parts annealed per kilowatt-hour. Each furnace has a capacity of 2,550 lb. per hour.

These electric furnaces took the place of box-type furnaces and have produced a much more uniform quality of material than did the fuel-fired furnaces. In the latter, work showed a wide variation in hardness after normalizing; this was due to quick and uneven cooling of the outer surface after removal from the furnace, and this was reflected back to the machine shop, where cutting speeds and feeds had to be set to suit hardness. The difficulty has been entirely eliminated with the electric furnaces. Saving in space, reduction in labor, decreased upkeep cost and increased production, in addition to greatly improved working conditions, have also resulted.

Hardening Furnaces

Five electric furnaces, in addition to the ring-gear furnaces described, are used for hardening gears, pinions, king bolts and differential pins. Two of these are Holcroft continuous pusher type. The material is placed on rails in the furnace on extremely light carrier blocks and is pushed through into a quench tank at the discharge end. Each of these furnaces has a connected load of 108 kw., controlled in two zones by Leeds & Northrup temperature control panels. The rated capacity is 900 lb. per hour.

Three Hoskins furnaces of the pusher type, with a nominal rating of 50 kw. in two single-phase circuits, are also used for hardening side gears, king bolts and pinion gears. The heating chambers of the furnaces are 4 in. high and 20 in. wide, two of them 10 ft. long and one 8 ft. long. Parts travel through the furnaces in grooves cut in the alloy floor plates; to prevent buckling, light spacers are used between pieces. The operating temperatures range from 1,145 to 1,440 deg. F. at the charging end and from 1,335 to 1,460 deg. F. at the discharge end. The average hourly demand ranges from 25.5 to 34.5 kw. per furnace and production is from 260 to 372 lb. net per kilowatt-hour.

On the five hardening furnaces a gross economy, including the weight of the spacers and blocks, varies from 10 to 13.3 lb. per kilowatt-hour, depending upon temperature and material, and the net economy for hardening is approximately 10 lb. per kilowatt-hour. The greatest advantages gained, however, have been the reduction in rejects caused by error of the human element and the elimination of scale, which in turn has done away with the necessity for sandblasting or brushing.

Carburizing Furnaces

Four Holcroft continuous electric furnaces, each of 444-kw. capacity, are used for carburizing ring gears, pinions, side gears and king bolts. These are also of the pusher type, operate non-compensating and discharge directly into an oil quench. Each furnace has four rows of conveyors, upon which are carried the carbonizing pots containing compound and the parts to be treated. Four rows of pots pass through each furnace on a time cycle of eight to twelve hours, depending upon the material and depth of case desired.

Except for loading and removal of parts from the pots after leaving the furnaces, the operation is entirely automatic. It is operated through standard General Electric control panels with Leeds & Northrup temperature control. The furnace is operated by an oil gear system, consisting of a pump and ram for each of the four rows and one ram for each of the four charging doors and the four discharge end doors. The cylinders on the charge and discharge end doors in each row are connected in series, so that both doors operate at the same time. As each row is individually controlled, the time of the push can be varied on any row. Timing is controlled by a Stromberg automatic repeating process timer, which actuates the cylinder valve through Cutler-Hammer relays, operating panels and solenoids.

The clock is set at the desired time interval of push, and when this interval has elapsed, the clock makes contact and operates the cylinder valve through operating relays and solenoids. The door rams operate first, raising both doors; then the ram pushes the pot into the furnace. The pusher then returns and the doors shut, completing the cycle. The box at the discharge end is removed from the furnace by hand and material is quenched in oil. The box is returned to the charging end in gravity rolls alongside the furnace. This roll conveyor is also used as a platform for loading the boxes.

ONE OF TWO TEMPERATURE CONTROL ROOMS IN HEAT-TREATING DEPARTMENT OF GEAR AND AXLE PLANT

Each of the four rows is controlled separately, there being four clocks on the furnace. Four temperature controls are used on each furnace, thermocouples being set down through the roof in the center of the furnace. There are four of these furnaces, each an exact duplicate of the others. Two furnaces were first installed, and as these saved their cost in reduced labor, improved material and over-all operating costs in 262 days, the two additional electric furnaces were ordered to replace the then existing box-type furnaces.

Four 30-kw. Homo electric drawing furnaces have just been installed and are used for tempering gears, pinions and small parts after hardening. These furnaces also replace fuel-fired furnaces formerly in use. The cycle of operation of these furnaces is approximately 50 minutes per charge at an average temperature of 400 deg. F. Under these conditions 45 lb. of material is treated per kilowatt-hour, and the output per furnace is 550 lb. per hour.

All temperature control equipment for the electric furnaces is located in two control rooms, one on each side of the heat-treating department. This equipment is in charge of a special attendant. Charts are kept showing

the operation of each furnace. It is thus possible to tell at any time from these two central points exactly what is going on in any one of the heat-treating operations. Exact conditions of temperature can be duplicated day after day, thus assuring an even and uniform quality of heat-treatment.

Saving and Advantages of Electric Heat

The use of electric furnaces in this plant has been increasing steadily during the last two years and the following definite results and advantages have been gained over the former fuel-fired equipment:

1. There has been no increase in heating cost as compared with the cost of fuel. In fact, the additional use of energy by the electric furnaces has lowered the average cost per kilowatt-hour for power purchased. The electric heating load has also helped power factor conditions in the plant.
2. Installation of electric heating equipment has so increased and stabilized production of the heat-treating department that the possible capacity of the entire plant has been raised from 1,000 to 4,000 complete units per day.
3. Labor costs in heat-treating operations have been materially reduced and in general are of the order of 20 per cent per unit produced.
4. Working and atmospheric conditions have been greatly improved by the almost total elimination of smoke, fumes and heat. This has resulted in increased production per man per day, and what is equally important, it is possible to keep a better class of labor on the work.
5. Improvement in quality and uniform hardness of parts treated has saved time in the machine shop and reduced wear on cutting tools.
6. At least 50 per cent saving in floor space has been realized with the use of electric furnaces.
7. Definite production of a given amount of material can be set up with the positive assurance that it will be turned out of the heat-treating department on schedule time and of a predetermined quality.
8. Fire risk and hazard to workmen have been reduced.
9. Automatic features have reduced and in many operations eliminated the possibility of error due to the human element.
10. General quality has been improved and rejected parts are exceptional.

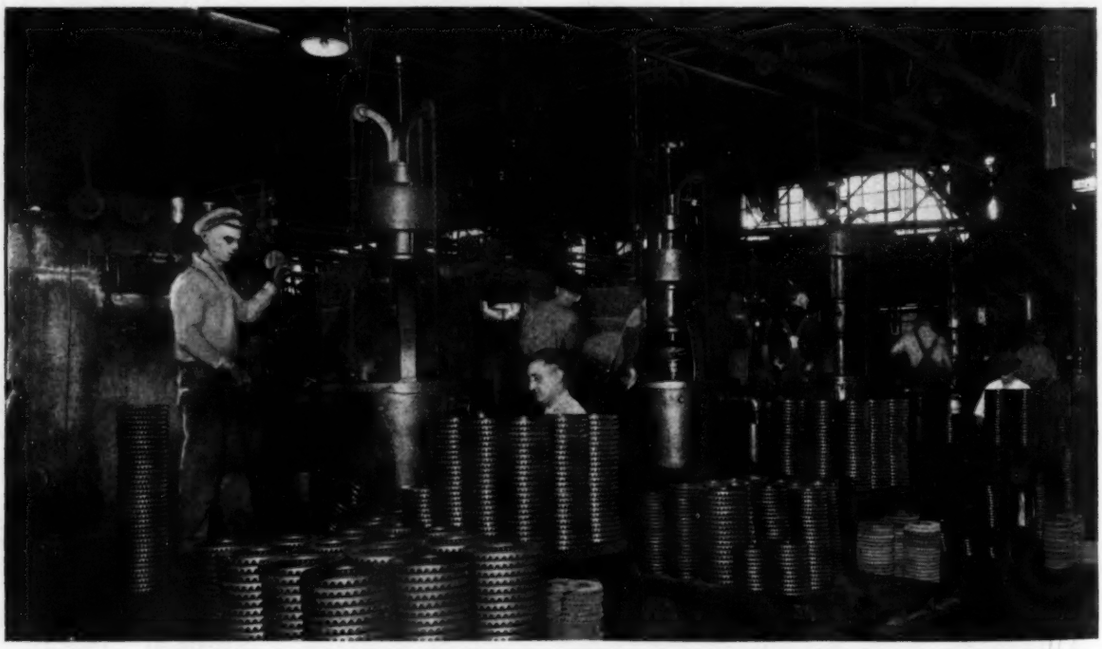
These installations of electric heating equipment in two plants represent only a few of many in operation in automobile and other manufacturing plants on the lines of the Detroit Edison Company. They are typical, however, of the trend among automotive production managers to adopt equipment that can be depended upon day after day to turn out material of the same uniformity and in the desired quantity at the lowest over-all cost. Electric heating equipment is doing these things; this fact, coupled with its ready adaptability to automatic control and continuous operation, makes electric heat invaluable to the automobile industry under existing competitive conditions and the public demand for still better automobiles.

Arc Welding Applied to Crane Construction

A 10-TON, 60-ft. span electric overhead traveling crane, fabricated entirely by means of arc welding, has recently been constructed by the Cleveland Crane & Engineering Company, Wickliffe, Ohio. Although arc welding has been extensively used in the manufacture of heavy-duty material-handling equipment, it is a decided innovation to build a complete crane of this type without the use of rivets. The crane was designed to secure the greatest possible rigidity with the same weight of steel that would be needed for riveted constructions.

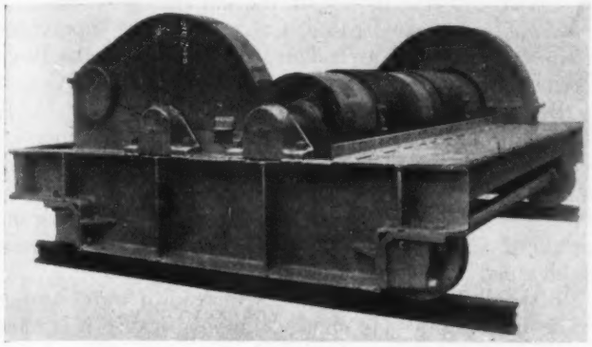
Each girder of the bridge is of the fish belly, box type, consisting of two webs and top and bottom cover plates. Both cover plates are arc welded to the webs by a fillet bead of welding metal. The two webs and the top and bottom cover plates are in effect an integral box section of steel with the joints as strong as the plates themselves. This joint is not relied upon entirely to take the stress in the girder. It is simply an auxiliary connection to give maximum rigidity.

Additional strength is secured by welding a round bar along the webs and cover plates at each of the four corners of the box section. The chief advantage of this construction over riveting lies in the manner in which the reinforcing member is attached to the plates. The reinforcing bar is welded to web and cover plates by a



BATTERY OF SEVEN HOLCROFT VERTICAL PUSHER-TYPE RING-GEAR ELECTRIC FURNACES. GLEASON QUENCHING MACHINES IN FOREGROUND

continuous bead for a distance of 60 in. from each end of the girder. Throughout the remaining length of each girder the bar is then joined to the plates at intervals of 3 in. by beads 4 in. in length. Bridge girders are reinforced by the customary diaphragms spaced at suitable intervals. The diaphragms are fillet welded to both webs and to the top cover plate, thus dispensing with flange angles. It has been demonstrated, the company claims, that the fillet-type weld can be made to develop unlimited



ARC-WELDED CRANE TROLLEY
Tying of side frames and reinforcement under the top plates may be noted

strength by simply depositing enough metal to give the required section.

No attempt was made in the design of this crane bridge to take advantage of the possible saving in weight of plates that is permissible by arc-welded construction. Although undoubted economies could be effected, the sole object of this design is to produce the most rigid possible bridge within the weights customary for a crane of the size. The success with which this objective has been attained is shown by the deflection under a 100 per cent overload test, which was less than that normally encountered in riveted construction.

The greatest advantages of arc-welded construction have been realized in the trolley. Here it was possible to save considerable weight and at the same time obtain greater rigidity and strength. The trolley is of all structural steel construction. The side members are standard channels. The bed for the hoist and trolley travel mechanism is flat plate with reinforcing plates arc welded under bearing points. The entire trolley frame is arc welded into one integral piece, and proper placement of the reinforcement insures permanent positive alignment of all shafts and bearings. The elimination of the laying out of rivet holes, punching, reaming and driving rivets, as well as some saving in material, contributed to lessened manufacturing costs.

Increasing the Value of Scrap Cable

Classification of materials and proper handling offer possibilities of large increase in amount receivable for discarded conductors

By N. S. Hinman
Commonwealth Edison Company, Chicago, Ill.

THE revenue-producing possibilities of salvaged wire and cable are sometimes overlooked by the utility companies, although a comparatively small investment, combined with a small amount of attention, can produce a relatively large increase in receipts.

An electric light company in a large city will have from 1,000 to 2,500 tons of scrap wire and cable to dispose of in the course of a year. A difference of one cent a pound in selling price can make a difference of $20,000 to $50,000 in yearly receipts. Companies may be assured that they are getting the top cent per pound by applying the same rules of merchandising to scrap material that are applicable to kilowatt-hour or electric shop sales. They are the same rules that apply to any merchandising —namely:

1. Know what you are selling.
2. Know where to sell it.
3. Know how to present it for sale in the form that will bring in the largest net return.

The insulating materials may be regarded as possessing no scrap value. The metals contained in the wire and cable used by electric companies are copper, lead, tin and antimony. If sold for scrap, this wire and cable will bring only scrap prices. If the metals are separated, cleaned and baled or pigged, the selling price will be materially increased. To learn the difference between the selling price of scrap metal, obtainable from cable and insulated wire, and that of the pure product it is necessary only to compare the daily quotations in the *American Metal Market* for scrap metals with the quotations for metals.

The copper in cable and wire is electrolytic copper of very high conductivity. It is worth practically 3 cents a pound more than scrap or casting copper. The lead

Suggestions for Capitalizing on Scrap

1. From its large cable, size 4/0 and over, the company sold 366 tons of "greasy" copper. Assume that in drying and baling this copper there was a 5 per cent loss in weight, leaving 348 tons, and that in selling this to smelter or manufacturer 2½ cents more a pound instead of 3 cents more were received for it. The selling prices would have been $185 a ton (the price received from junk men) plus ($0.025 × 2000) $50, or a total of $235 per ton. For 348 tons the company would have received $81,780.

2. Similarly the 465 tons of lead cable sheathing, allowing a 5 per cent shrinkage and 2 cents instead of a 2½ cents increase per pound in selling price, would have returned $55,250 to the company.

3. In the case of the small cable, assume a shrinkage of 23 per cent for the weight of the insulation plus 5 per cent for metal loss in handling. This reduces the 442 tons to 318 tons of metal recovered. The ratio of lead to copper in the cable was lead:copper::56:44, so that 140 tons of the 318 tons recovered would be copper and 178 tons lead. Then 140 tons copper at $235 plus 178 tons of lead at $125 would equal a total yearly figure for this type of cable of $55,150.

4. In the case of the 200 tons of scrap wire, assuming the weight of the insulation plus the loss of metal in handling as one-third, there remains 133⅓ tons of copper, which, selling at $235 a ton, will bring in $31,332.

covering has a tin or antimony content that enhances its value. Whereas scrap lead might be worth $6.25 and pure lead $7.25, the lead alloy covering for cable can be sold for an even higher price.

A lighting company recently sold the lead covering stripped from cable to the junk man for $4 per 100 lb. when the scrap market for lead was $6.25, the metal market $7.25 and the value of the lead alloy even greater than the latter figure. The same company sold its salvaged copper wire for $9.25 per 100 lb. when the market for electrolytic copper was $12.90. The additional handling cost necessary to sell this cable and wire as metal instead of selling them as scrap would not have consumed the net increase possible in revenue if there had been sufficient volume of material.

During 1926 the company in question sold 366 tons of "greasy" copper recovered by stripping cable, size 4/0 and over; 465 tons of lead covering stripped from this same cable; 442 tons of small cable with metal and insulation unsegregated; 200 tons of insulated wire.

Averaged over the entire year the prices received for this material were:

366 tons of "greasy" copper at $185	$67,710
465 tons of "greasy" lead at $85	39,525
442 tons of small sized cable at $80	35,360
200 tons of scrap insulated wire at $110	22,000
Total	$164,595

The total received for the 1,473 tons was $164,595. The company had sold its material as junk to the junk man.

If, instead of selling scrap metal and scrap insulated wire and small cable to the junk man, the company had cleaned and baled all the copper, selling it, not to the junk man to clean, bale and resell, but to the smelter or manufacturer at the price of electrolytic copper, and if all lead had been pigged and sold to the smelter or manufacturer at the lead metal price plus the added value of the tin or antimony content, the company would have received 3 cents a pound more for the metal, through the procedure indicated in the accompanying panel.

By adopting the procedure suggested on page 935 the total 1926 receipts for salvaged wire and cable for the company in question, provided it had cleaned and baled its copper and pigged its lead, would have been the sum of the four items, or $223,512. Deducting from this total the amount actually received, $164,595, there appears to be a gross possible gain in revenue of $58,917.

However, there is an additional handling charge to be taken into consideration, consisting of further labor costs, interest on investment in equipment, depreciation, upkeep, etc. An oven can be built, of sufficient size to handle from five to ten tons a day, for less than $2,000, and as this is the main item of expense, $10,000 should cover all contingencies. At 6 per cent plus 10 per cent for upkeep, depreciation, etc., $1,600 a year should carry the investment charges. There was already some labor cost for handling charged against the selling of the material, consisting of the cost of stripping the large cable and collecting and supervising the sale of all the material in question. Certainly $5 a ton should amply cover all additional labor costs chargeable to purification of the metal. For 1,473 tons this additional expense would have been $7,365. The total additional yearly cost would have equaled the sum of these two figures, or $8,965.

Deducting this amount from the gross gain in revenue, $58,917, there is a net gain of $49,952, representing a 30.3 per cent net increase over the actual gross sales.

An investment of $10,000 in equipment would have yielded a potential net profit of about 500 per cent.

Celluloid Model of Experimental Arch Dam Aids Tests

A CELLULOID model of the Stevenson Creek arch dam built near Fresno, Cal., under the supervision of the committee on arch dam investigation of the Engineering Foundation, has been contrived by Prof. George E. Beggs of Princeton University, assisted by D. B. Sloan, a graduate student of the Princeton Engineering School. The Engineering Foundation could not afford to build and test more than one full-size dam since the expense would approximate $100,000 for each such undertaking. Yet the information needed cannot, it is said, be obtained from one specimen.

Professor Beggs used mercury instead of water against the celluloid dam. He chose celluloid because it is more easily worked and more limber than concrete. The deflections and strains of such a model would be much larger than those of a model of the same size made of concrete. He used mercury instead of water because it was thirteen and one-half times as heavy as water and would cause proportionately greater deflections and strains.

The Princeton model is 18 in. high, or one-fortieth the size of the Stevenson Creek dam, and a little over ½ in. thick for the greater part of its height. The gorge or canyon is made of concrete, without, of course, the irregularities of the natural rock. By bending several sheets of celluloid and cementing them together, and then carving the face, a model of exactly the same shape as the real dam was produced. The reservoir is only ¼ in. long. Professor Beggs believed that such a small reservoir was sufficient because the pressure of a fluid against a dam varies with its depth and not at all with the distance it extends back of the dam. The high price of mercury and its weight were additional reasons for making the reservoir as small as practicable. The mercury was used over and over again for all the tests.

To measure the strains—the stretching or compressing—at the downstream face of the dam, the Tuckerman optical strain gage was used, which measures to one-millionth of an inch. With the aid of this instrument the strains were measured at all parts of the downstream face of the model. To avoid laborious mathematical solutions, a practical method of solving many types of indeterminate structures by the aid of elastic models has been developed, according to Professor Beggs.

Germany Has 300,000-Kva. Station

THE new Klingenburg electric power station, recently placed in operation by the Berlin Municipal Electricity Company has an initial capacity of more than 300,000 kva. The plant now in operation comprises three main turbines and generators, each of 88,000-kva. capacity, and three preheated 12,500-kva. turbine sets generating current at 6,000 volts. Steam is supplied by a battery of sixteen boilers, each having a heating surface of 18,837 sq.ft. The boilers, which are all fired by pulverized fuel, work at a pressure of 514 lb. per square inch and generate steam at a temperature of 425 deg. C. In order to save time in fabrication, the sixteen boilers were constructed by eight different German concerns.

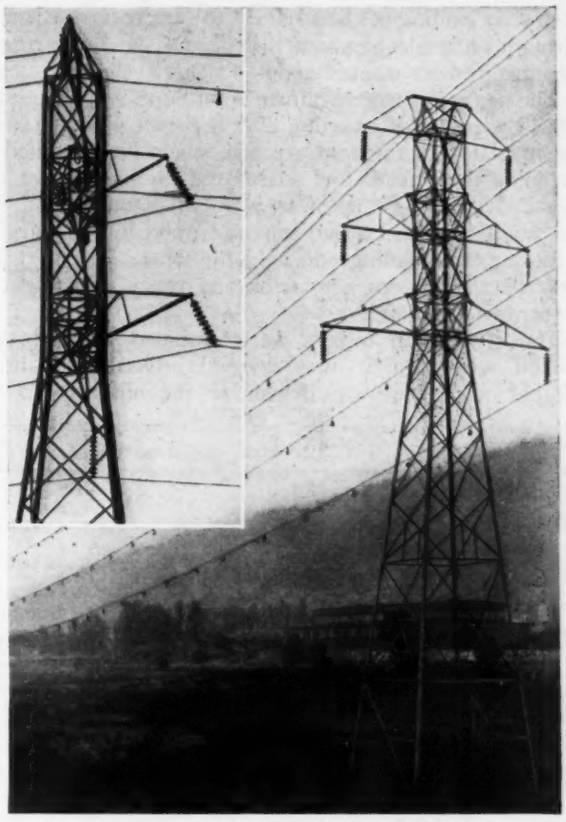
Tests of Hinged Crossarms

Indicate effectiveness of this simple development in tower design for saving steel and still preventing torsional failure of towers when wind or sleet breaks conductors

THE effectiveness of hinged crossarms on steel towers was demonstrated at Leetsdale, Pa., Oct. 21 by the Riter-Conley Company. As explained in the Oct. 29 issue of ELECTRICAL WORLD, about one mile of transmission line had been built for the occasion involving two circuits of 336,400-circ.mil aluminum-conductor steel-reinforced cable and ground wire spaced for 132-kv. operation. The spans averaged 1,000 ft. All the conductor tensions in one circuit were approximately 8,000 lb. (conforming with the N.E.L.A. Class B loading). As illustrated the towers do not appear unusual, but the crossarms are hinged near the tower so they will swing into the direction of the line if a conductor breaks, thus relieving the stresses in the tower. In the test the second conductor from the top was broken first and finally the bottom one.

It was impossible to observe all points of interest* when the conductors were dropped, so in the first test the action of the first crossarm away from the cut span was made the center of attention. Despite the heavy loading of the conductor, the crossarm swung away from the broken span without any apparent shock, the off-vertical hinging of the arm retarding the motion and the pull of the intact span damping any tendency of the arm to overswing and recover. A tremor was visible in the tower, as might be expected. The broken span appeared to strike the tower before the unbroken span dropped into proximity of the lower conductor, so that ground relays could have been expected to clear the circuit before any arcing between phases could occur if it had started on an energized line. The unbroken span swung toward the center line of the tower and clear of the conductor below it, coming to rest with a minimum ground clearance about 5 ft. less than the lower conductor. In the fall of the conductor a wave appeared to travel along it to the next tower. Some observers remarked that the conductor in its swinging fall approached the intact circuit on the opposite side of the tower, but H. O. Hill, transmission engineer of the Riter-Conley Company, pointed out that any hazard from this possibility could be avoided by increased horizontal clearances. No means were handy for measuring the crossarm angles accurately, but it appeared that the first crossarm rested at 80 deg. from normal and that of the fifth tower, only 3,850 ft. away, was apparently unmoved, indicating that

*The manufacturer took motion pictures from several vantage points which may show actions unobserved by any single individual.



ONE OF THE HINGED CROSSARM TOWERS BEFORE AND AFTER TWO CONDUCTORS WERE CUT

conductor equilibrium had been established in the intervening space.

The bottom conductor and crossarm were observed from a position directly in line with the tower when this conductor was cut. The crossarm swung more violently, perhaps because of its greater length, but apparently did not strike the tower body, being retarded in its travel by the same forces mentioned before. The greater length of the crossarm also increased the sag more rapidly and the conductor struck the ground, so the forces were dissipated more quickly. However, the upper member of the crossarm near the insulator attachment did fail, but Mr. Hill pointed out that the towers purposely had been designed light to detect weak spots, and it will be necessary only to design heavier members to withstand the shock. In this case the equilibrium of the conductors was established in a shorter space than with the first test.

Various other tests have been made on this experimental line, the results of which have been made available by Mr. Hill as follows:

On July 27, with an initial wire tension of 2,820 lb., a top and a middle wire were dropped. Each wire fell clear of the others. The shock was measured with a dynamometer and amounted to 4,200 lb. in each wire. Both the crossarms and towers performed their functions in excellent manner.

Three wires on one side of the tower were then loaded with sacks of steel punchings at 20-ft. intervals for the entire length of the line. Each sack weighed 24 lb. This loading represented the condition of ½ in. of ice and 8 lb. of wind and produced a tension of 7,000 lb. in the wires at 80 deg. F.

The wire loading of sacks was applied first to the

center span, to represent the condition produced by uneven sleet loading. The adjacent tower crossarms rotated through an angle of about 8 deg. and the crossarms on the next towers rotated about 4 deg.

The next tests were performed on Sept. 9. The middle loaded wire was dropped. The "U" bolt which attaches the insulator to the crossarm on tower No. 1 failed by stripping the threads and passed the loading on to tower No. 2. This "U" bolt was $\frac{5}{8}$ in. in diameter and was too small for the loading imposed upon it. Tower No. 2 took up the loading and held the wire. The wire fell clear of the bottom conductor and every other feature performed very well.

The suspension towers were designed for only one broken wire, but it was deemed advisable to break another wire better to determine the strength of the towers. The bottom conductor was then dropped with very satisfactory results. The first tower now had full loading from one wire, whereas the second tower had full loading from one wire and partial loading from another wire. These tests proved that the towers will withstand considerable excess longitudinal loading over the design.

On Sept. 10 it was decided to break the top wire, with the expectation that it would wreck the line. This wire was dropped and it produced no ill effects on the line. The shock loading on each of these wires amounted to 8,800 lb. and the final tension was 4,000 lb.

Tower No. 1 had the full unbalanced loading from two broken wires and tower No. 2 had full unbalanced loading from one broken wire and partial loading from two additional wires. The towers were designed for the condition of only one wire broken at an assumed tension of only 4,000 lb., with 50 per cent overload. This design tension is only half the wire loading. This gives the ultimate strength of the design as 6,000 lb. on one wire.

The tests showed that the towers are very resilient against longitudinal loading, and that the effect of a broken wire is practically dissipated in five towers:

Tower No.	Rotation of Arms (Deg.)	Tower No.	Rotation of Arms (Deg.)
1	90	4	30
2	80	5	10
3	60		

After the tests the towers were examined carefully to obtain any necessary data for improving the designs. It was found that some of the connections adjacent to the crossarms had received severe shock loading. This shock sheared some bolts attaching the lower crossarm to the tower at the second tower. It is very probable, however, that a bolt was omitted at this connection during erection, because the first tower showed no signs of stress at this point and it was more severely loaded, because it was adjacent to the break in the wire. This condition permitted the crossarm to drop slightly out of position, but it did not drop the wire.

The towers were not designed to withstand the shock stresses that developed during the tests with broken wires, and it is therefore to be expected that some of the fittings adjacent to the points where the shock was applied should require some slight strengthening. A few bolts and some slight reinforcement adjacent to the crossarm connections to the tower are all that is necessary to strengthen these towers against the loading applied. The bodies of the towers showed no signs of stress.

Observations on Previous Tests

As a result of these tests, Mr. Hill says: "It has been proved that a transmission line may be designed with revolving crossarm towers, which will effect considerable saving in steel and produce a line that has very flexible characteristics but is very resilient against the stresses produced by broken conductors.

"The towers will present no difficulties while stringing conductors and also will have certain advantages in case a wire should become caught while stringing.

"There is another advantage in the fact that when a wire breaks, the crossarm relieves the tension to the extent that the wire will usually remain in position in the clamp and thus simplify the operation of resagging the wire.

"Slipping clamps for wire attachment, which are being used on some lines to relieve the tension when a wire breaks, will not operate when the wire and clamp are coated with sleet, and this is the time it may be needed most. The slipping clamp will usually damage the conductor, especially when used on conductors composed of composite metals. The slipping clamps do not reduce the torque moment arm. The wire remains at the same distance from the central axis of the tower.

"The revolving crossarms cannot be frozen up with sleet, but must always act, and they reduce not only the tension but also the torque moment arm.

"Fittings designed with breakable pins or other connections that will break to relieve the tension of the line when subjected to longitudinal loading are likely to break when they should not, and not break when they should.

THE SPACING OF THE TEST TOWERS

	Span (Ft.)
Terminal tower First suspension tower	150
First suspension tower Second suspension tower	1,000
Second suspension tower Third suspension tower	800
Third suspension tower Fourth suspension tower	1,125
Fourth suspension tower Fifth suspension tower	925
Fifth suspension tower Terminal tower	900

LOADING OF THE LINES FOR OCT. 21 TEST

Case A—Simultaneously applied loads representing the condition of one broken conductor at 4,000 lb. with Class B N.E.L.A. loading and 5-deg. angle in the line.

I—Vertical loads of:	
1,550 lb. at ground wire	1,550
1,650 lb. at each five unbroken conductors	8,250
875 lb. at one broken conductor	875
Total	10,675
II—Cross line loads of:	
2,100 lb. at ground wire	2,100
2,100 lb. at each of five unbroken conductors	10,500
1,050 lb. at one broken conductor	1,050
Total	13,650
III—Parallel line loads of:	
4,000 lb. at any one conductor	4,000

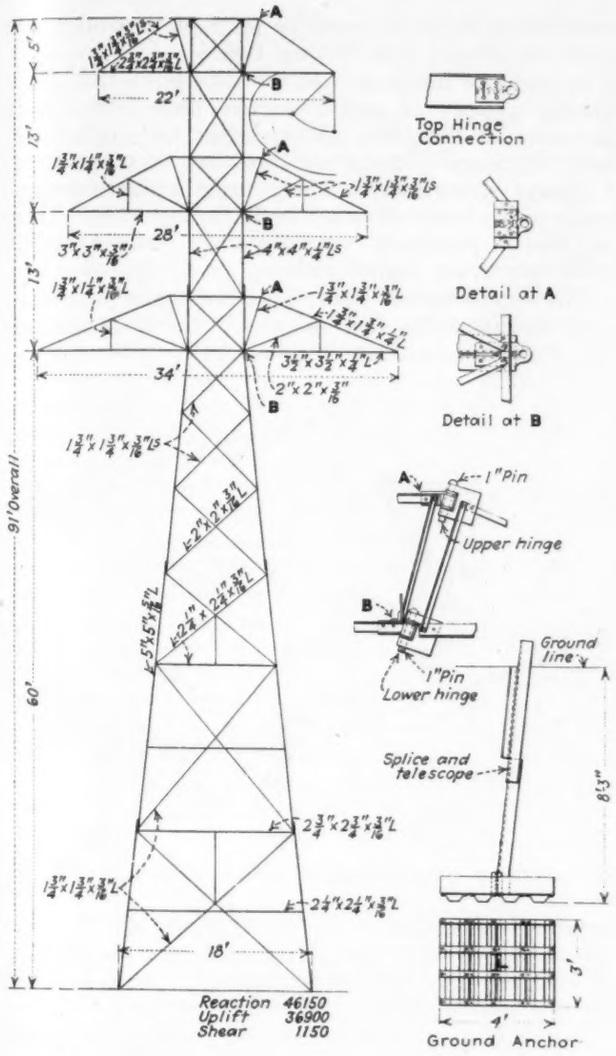
IV—Wind on steel at 13 lb. per square foot on $1\frac{1}{2}$ times the area of one face.

V—Dead load of steel in tower.

Case B—Wires coated with $1\frac{1}{2}$ in. ice radially none broken; tangent; no overload.

I—Vertical loads of:	
6,000 lb. on ground wire	6,000
6,000 lb. on each of six conductors	36,000
Total	42,000

II—Dead load of steel in tower.



SAVING IN STEEL AND AVOIDANCE OF TENSIONAL FAILURES ARE FEATURES OF THIS CONSTRUCTION

The axis of the hinge is inclined from the vertical. This construction produces stability in the line and has a damping effect upon the revolving arm, because the wire must move upward, due to this inclination of the axis, and raise the weight of the wire and insulators. The inclined axis also restrains the arms while sagging the wires. The revolving arms proved to be advantageous for stringing wires when one of the wires caught while threading it through the stringing sheave. A rigid crossarm would have been broken, but the revolving arm rotated and relieved the condition until the team of horses, used for pulling the wire, could be stopped. The middle cross is made longer than the top arm and the bottom arm is made longer than the middle arm to provide the usual additional vertical separation of conductors for sleet loading and also to keep the wires from coming into contact while falling after breakage. If a top wire breaks, it falls downward and inward toward the axis of the tower, due to the revolving crossarm, and away from the middle and bottom wires. A middle wire in like manner falls away from a bottom wire.

They might also break with the condition of a temporary unbalanced tension due to sleet on one span and not on the adjacent span, or due to the limb of a tree falling against a wire but not remaining thereon. The line would then come down and have to be restored to service by a line crew of men.

"The revolving cross arms will revolve slightly to relieve unbalanced tension and will automatically drop back to position when the unbalanced condition is relieved.

"The weight of hinged crossarm towers and footings is as follows: Towers, 7,750 lb.; footings, 1,650 lb.; tower and footings, 9,400 lb.

"This weight is about 20 per cent less than that of a tower with rigid crossarms designed for similar loading conditions. If the comparative designs were made for a similar line but for the condition of any two conductors broken instead of one, the saving in steel would be considerably more than 20 per cent. The saving in all cases will depend upon the loading conditions and will be small for light construction and large for heavy construction.

"If one ground wire is required, it may be suspended from the top of the mast as used on the test tower. If two ground wires are required, they may either be suspended from a rigid crossarm at the top of the tower or preferably be attached to another revolving crossarm placed above the conductor arms.

"At strain positions and at points of large angularity in the line, towers of regular design with rigid crossarms will be employed."

Hinged Crossarms with Conductors in Horizontal Plane

Another type of tower can be used when it is desired to have all wires in the same horizontal plane. In this case, for a double-circuit tower, each hinged crossarm supports three conductors. This arrangement is preferable for all transmission lines, believes Mr. Hill, if the width of right-of-way will permit. It is highly advantageous when lines traverse sleet territory, because there is absolutely no possibility of having one conductor sag into another due to sleet loading.

Another advantage of the horizontal arrangement is that it keeps all of the conductors close to the ground, at the same keeping relative potential above the ground. This will reduce lightning disturbances on the line.

The horizontal arrangement of conductors, with all wires outside of the body of the tower, makes the stringing of wires much easier than with any other type of tower. There will be no interference with other wires or crossarms when stringing each wire.

It will be noted that none of the conductors pass through the body of the tower, as is usual with regular construction when the wires are arranged horizontally. Wires passing through the body of the tower are very likely to be seriously affected by lightning disturbances, says Mr. Hill, on account of the proximity of the conductors to an encircling steel cage, and may have a serious effect upon the stability of the line. He also points out that the usual type of tower, when designed with conductors in a horizontal plane, requires a very wide tower, which occupies excessive ground area that can seldom be cultivated and is often quite valuable. The revolving crossarm tower will not require a wide base or heavy footings.

If one ground wire is required on the flat-type tower, it may be suspended from the top of the tower mast. If two ground wires are required, they may be suspended from a rigid or from a revolving crossarm, or be better attached to the top chord of the main crossarm. This will prove to be the most economical arrangement and will permit the ground wires to share all of the advantages involved in the revolving crossarms.

With the horizontal arrangement of conductors, when a conductor breaks, the crossarm will rotate slightly in the direction of the unbalanced tension. This will relieve the tension on that side and increase the tension on the opposite side of the crossarm, until equilibrium is reestablished. It will be necessary only for the crossarm to rotate through a very small angle.

Dead-end and angle towers for use with the horizontal arrangement of conductors will preferably be made with the same general configuration as the suspension towers,

using a central tower structure and long rigid crossarms. This, of course, will require heavier towers than would be required if the conventional configuration were adopted, but this extra weight in a few special towers will have little effect on the total weight of steel required in a line.

80 Per Cent Boiler Efficiency with Low Plant Factor

By Lawrence Washington and H. W. Meyer
Northern States Power Company, Minneapolis, Minn.

AT CERTAIN periods of the year the hydro plants of the Northern States Power Company carry the base load of the system, and at other times the steam plants carry the base load. In other words, there are extended periods during each year when the steam plants are normally operating at light load, but must be prepared to pick up additional load on very slight notice.

Formerly it was the practice in these steam plants to operate as many boilers at high ratings as were needed to carry the station load and to have available additional boilers, under "dead banked" conditions, to take care of such emergency loads as it might be necessary to carry. During such light-load periods, therefore, the average boiler efficiency, and consequently the plant thermal efficiency, was considerably lower than during heavy-load periods.

Because of the fact that such banking of boilers involved a very large expense, experiments were begun at Riverside station, Minneapolis, to determine whether or not it was possible to operate boilers under light-load conditions and still obtain an efficiency approximating that obtained at high ratings. These experiments were carried on under the direction of J. L. Hartney, who was at that time plant results engineer and who, together with William Shore, chief engineer, conceived the idea.

The first tests were run on a Babcock & Wilcox boiler of the cross-drum type, with 13,600 sq.ft. of steam-making surface, fired by a Westinghouse fourteen-retort, seventeen-tuyère, double-dump, moving-grate stoker. The superheater was of the convection type with 3,600 sq.ft. of surface. The grate area was 263 sq.ft. and the furnace volume 2,486 cu.ft. The front of the furnace has a sloping arch. The plant is not equipped with economizers.

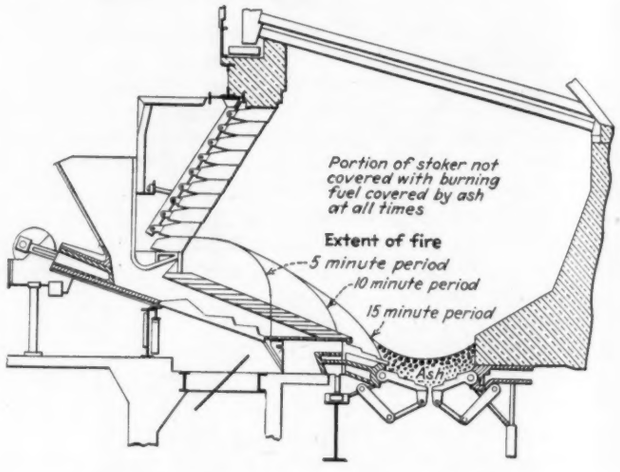
TEST RUNS AT LOW RATINGS

Period of Stoker Operation (Minutes Per Hour)	Pounds Coal Fired	Approx. Boiler Rating (Per Cent)	Steam Temp. (Deg. F.)	Flue Gas Temp. at Superheater (Deg. F.)	Flue Gas Leaving Boiler (Deg. F.)	Steam Pressure (Lb. Gage)	CO_2 (Per Cent)
15	1,400	35	440	448	397	215	10.3
10	945	24	440	453	400	215	7.1
5	570	14	433	431	389	215	4.6

Preliminary runs were made by operating the boiler for periods of two or three days with the stack damper entirely closed and the stoker operating intermittently for periods of fifteen, ten and five minutes in each hour. The fuel-bed contour obtained in each case is indicated in the accompanying sketch, and the average results obtained for each run are given in the accompanying table. In these runs the refuse was allowed to accumulate in sufficient quantity to cover the parts of the stoker that were not covered with burning fuel.

It might be inferred from the data given that a still greater quantity of fuel could have been burned with the same air flow, thus giving higher CO_2 and higher boiler efficiency. This would, however, have resulted in a greater steam flow, a lower steam temperature and consequently lower efficiency in the turbine room. There was also the possibility of burning stoker parts if the CO_2 were carried any higher with so low an air flow.

The fifteen-minute stoker operation gave promise of good results, as the fuel bed was in excellent condition for a sudden increase in load. For this reason a weighed-coal efficiency test of 76 hours' duration was run at 35 per cent rating. This run gave an efficiency of 79.5 per cent, with 10 per cent CO_2, stack loss 10.8 per cent and carbon-in-refuse loss 0.8 per cent.


Portion of stoker not covered with burning fuel covered by ash at all times
Extent of fire
5 minute period
10 minute period
15 minute period
Ash

FUEL-BED CONTOURS IN LOW-RATING OPERATION TESTS

In this test and in the preliminary runs it was found possible to maintain a uniform fire and good ignition by carrying about 0.1-in. forced draft, with practically atmospheric pressure over the fire. This did not increase the total air flow over that obtained with zero forced draft, but it did increase the quantity of air flowing through the fuel bed, with a corresponding reduction in air leakage in other parts of the furnace, and resulted in higher CO_2 content of the flue gas and in improved ignition.

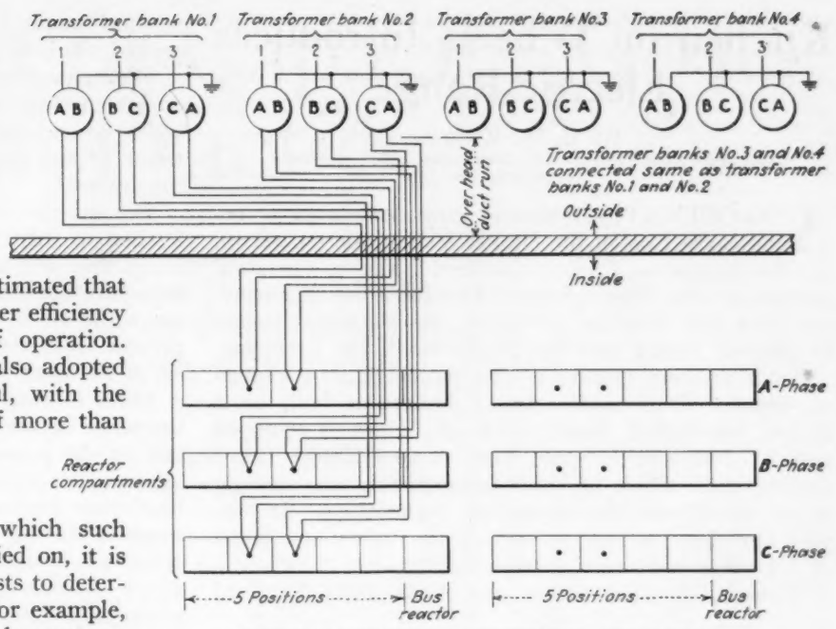
Another similar test was run on a different boiler of the same capacity but having a slightly larger superheater and a furnace of somewhat greater volume, with a vertical front wall. This test gave 76.4 per cent efficiency at 50 per cent rating, with a 9.4 per cent CO_2. The higher rating in this case was due to a greater draft resulting from other boilers discharging into the same stack and also to the fact that it was necessary to operate the boiler at relatively high ratings for a period of two to three hours each day to improve the fire. The lower efficiency in this test is accounted for by a stack loss of 12.2 per cent and a carbon-in-refuse loss of 2.4 per cent. These higher losses were due to a relatively uneven fuel bed, as compared with the previous test.

These tests were so satisfactory that it was decided to commence operating regularly under similar conditions. Results obtained at Riverside station in 1922 and 1924 on the old basis of "dead banking" and those obtained at the same station in 1926 with low rating operation offer a striking comparison. During four months in

the years 1922 and 1924, when the average monthly plant factor at this station was only 6.2 per cent, the average monthly boiler room efficiency was 68.2 per cent. During six months of 1926, under the new method of operation, when water-power conditions were good and the average monthly plant factor at Riverside station was only 5.5 per cent, the boiler efficiency averaged 80 per cent. It is estimated that at least two-thirds of this increased boiler efficiency is attributable to the new method of operation.

The same method of operation was also adopted at the High Bridge plant in St. Paul, with the result that monthly boiler efficiencies of more than 78 per cent have been obtained on a plant factor of only 5 per cent.

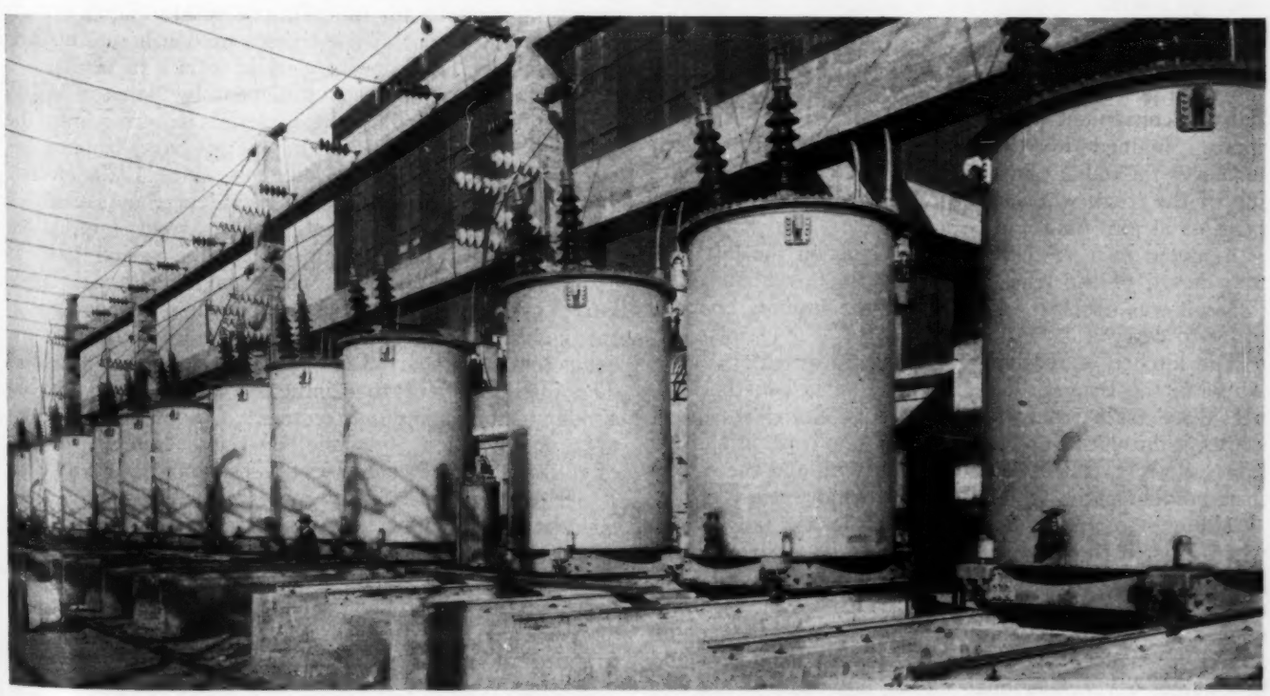
To apply this method of boiler operation at low rating to a plant in which such operation has not been previously carried on, it is necessary to make a few preliminary tests to determine the proper method of control. For example, it was found in some instances that the damper was not tight enough, even when entirely closed, to hold the draft down to the proper point. In this case the damper was rebuilt to cut down the leakage. Draft control is the essence of this method. The fuel bed must, of course, be maintained as evenly as possible, and it appears that slightly more than 10 per cent CO_2 content in the flue gas is the best that can be expected.



SCHEME OF LOW-TENSION CONNECTIONS AND CABLE RUNS

Concrete Structure Serves Triple Purpose

A RATHER novel method of connecting delta transformer banks with phase-separated bases is used at the Columbia station of the Columbia Power Company, Cincinnati, Ohio. The phases are horizontally separated in two groups and the transformers are placed in a horizontal row as shown. From each of the two groups of buses twelve single-conductor cables are carried in an overhead concrete duct line to the reinforced concrete frame shown above and behind the transformers. The lower part of this frame is a duct line through which the cables from the station are carried and from which the cables are dropped at proper spacings to make the connections on the low sides of the transformers. The frame is extended upward to serve as a high-tension bus rack and take-off for the outgoing lines. The delta connections on the low side are made inside the station at the cable potheads, two cables of each phase coming to a common point to accomplish this purpose.



TRANSFORMER BANKS AT COLUMBIA STATION OF THE COLUMBIA POWER COMPANY

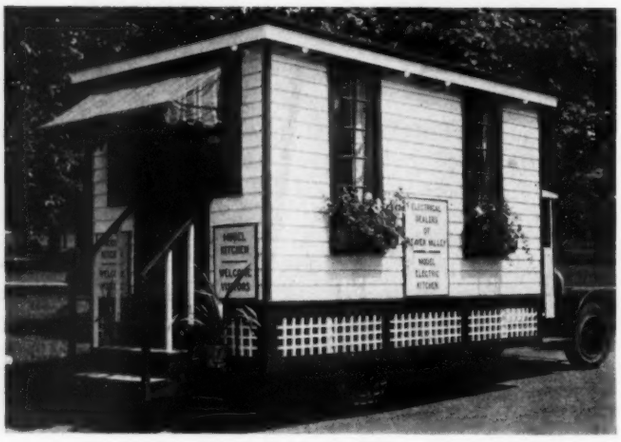
Kitchen on Wheels Introduces Electric Range

By H. W. Ewald
Manager Sales Promotion Duquesne Light Company
Pittsburgh, Pa.

A CO-OPERATIVE electric range campaign is being carried on in the Beaver Valley district, served by the Duquesne Light Company. The co-operating parties are the Westinghouse Manufacturing Company, the Iron City Electric Company, the electrical dealers of Beaver Valley and the Duquesne Light Company.

An interesting feature of the campaign is a kitchen on wheels. This model electric kitchen is built on a 2½-ton, low-bodied, Brockway truck, which is equipped with a 1,500-watt, 110-volt direct-current Kohler farm-lighting unit, which operates automatically, the turning on of any 25-watt device starting the machine. It supplies sufficient current to operate the lights and much of the other equipment simultaneously.

When building the kitchen, one of the points discussed



PORTABLE ELECTRIC KITCHEN USED BY DUQUESNE LIGHT COMPANY

at length was whether it was more practicable to use the farm power plant or to connect the kitchen to power lines at convenient places. It is believed that the flexibility obtained by the present arrangement greatly enhances the value of the kitchen. It permits the lighting of the truck while it is moving and makes operation possible at any time and at any place. The power unit is mounted in a specially built housing on the left running board of the truck. It weighs approximately 560 lb., so it was necessary to reinforce the running board in order to carry it.

The kitchen is receiving enthusiastic attention everywhere in the Beaver Valley. When parked in the business districts, in front of the respective electrical dealers' stores, it draws such a crowd that in one case, in spite of a broad street, traffic was interfered with and the policeman politely requested the driver to move.

Although a great number of people see the kitchen when it is in the town districts, it is in the residential neighborhoods that its work is most effective. The novelty of bringing an electric range to a woman's very door and showing it to her in its proper setting—an attractive, modern kitchen—creates unusual interest and also makes a very personal appeal, especially if she has just stepped out of a hot and stuffy kitchen. The salesmen call at the homes in the block where the kitchen is parked and invite the women to come out and see it.

They report that more than 75 per cent of the women on whom they call come to see the kitchen, and many others come uninvited. The extremely attractive exterior of the kitchen is responsible, partly at least, for this interest.

The interior is approximately the same size as the kitchen in the average modern home. It is furnished completely and attractively. Wall lights and a kitchen luminaire abolish gloom and shadows. An electric fan keeps the air in circulation. An electric refrigerator is present, of course. However, the central point of interest is the electric range.

Here, in this pleasant and proper atmosphere, with the range before him, power to operate the surface units and in the presence of a small group of women, the salesman gives his talk. Because the women are neighbors, they feel at ease and a discussion regarding the range is started. The salesman takes advantage of this discussion to develop his arguments. He also studies the women closely and selects those he thinks are good prospects for follow-up calls.

Plans are being made to utilize the portable idea for the promotion of electric refrigerators and other home equipment.

The Electrical Industry and the Contemplated Federal Investigation

THE community of interest of those engaged in the electric light and power industry and the importance of maintaining private ownership were stressed by Howard T. Sands, president of the National Electric Light Association, at a luncheon of the New York Electrical League on Oct. 26. The manufacturer, the jobber and the contractor-dealer depend upon the utility for their very existence, he said. The utility is likewise dependent upon these commercial men, and the prosperity of one is the prosperity of all. The immediate problems foreseen for the industry by Mr. Sands are the adequate equipment of the sixteen million homes already wired and the extension of electric service to farms.

In reply to a published statement by Senator Walsh of Montana that while the materials entering into the production and distribution of energy have dropped between 25 and 40 per cent in cost since 1920, electric rates have not been reduced, President Sands asserted that this statement conveys an incorrect impression, because rates did not go up during the period 1913 to 1920, when material prices were rising. Although legislative investigations retard any business concerned in them, the electrical industry none the less will welcome competent and impartial fact finding, the speaker declared. The institution for that industry of a federal bureau similar to the Interstate Commerce Commission is, however, unwarranted, for while between 70 and 80 per cent of railroad commerce crosses several state lines, less than 7 per cent of electricity generated crosses any state boundary. The idea that it is proper for the government to engage in business was attacked, and Mr. Sands asked for a concerted resistance to the contemplated perversion of governmental functions and the institution of policies contrary to the spirit in which the nation was founded and under which it has progressed.

Arthur Williams, founder and past-president of the league, commended the viewpoint of the speaker.

Allocation of Capacity Costs in Practice

Consumption and demand method used by Iowa utility in rate to forty towns. Majority of customers choose this rate where option is available. Rate results in smooth curve

By ARTHUR H. FORD

Professor of Electrical Engineering State University of Iowa

THE recent rapid expansion of the electric transmission lines of the country and increased efficiency of steam turbines have greatly changed the relation between the fixed capital expenses and the energy expenses of serving electric consumers.

Although the present net return may show a profit on the investment, there is danger that electric power station managers will be overinfluenced by the reduction in the generating cost and make rate reductions to the wrong consumers, thereby bringing about losses that could be avoided if rate reductions were governed by reliable cost analysis. The consumption and demand method of cost allocation proposed by W. J. Greene* about two years ago has been employed by the Iowa Railway & Light Corporation for several years and has proved to be a reliable cost allocation method; therefore the writer presents the details of the system as applied to 40 towns of less than 2,000 population, connected to an extensive transmission system.

The equations given in the article to which reference is made have the general solution

$$c = \frac{kC(D-P)}{P(8{,}760D-K)} + \frac{dC(8{,}760P-K)}{P(8{,}760D-K)}$$

in which

c is the capacity cost of serving a consumer having a demand (d) in kilovolt-amperes and a yearly consumption (k) in kilowatt-hours.

C is the capacity cost for supplying these towns.

D is the sum of the consumer's demands in kilovolt-amperes.

P is the peak load on the power station in kilovolt-amperes.

K is the consumption of all the consumers in kilowatt-hours.

The following statistical data apply to the year for which the capacity cost allocation was made:

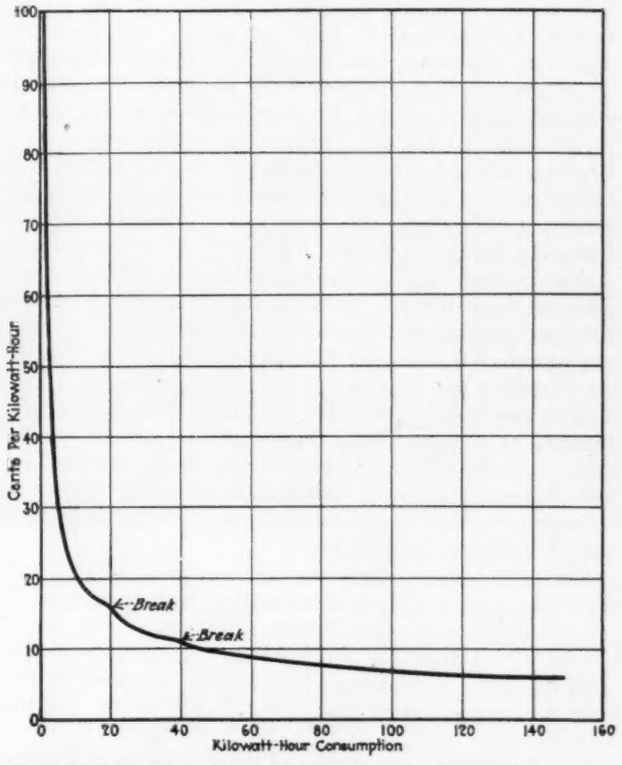
Number of consumers	5,112
Peak load (P) on power station, kva.	1,160
Sum of consumer's demands (D), kva.	5,293
Consumption of all consumers (K), kw.-hr.	1,499,075

The production and transmission capacity costs were allocated to the towns by the consumption and excess demand method due to W. J. Greene, C. F. Schoonmaker and C. B. Gorton and were made public in the ELECTRICAL WORLD in 1922; they were advanced by H. W. Hills under the name of the "Phantom Customer Method" and presented in a paper that received the Henry G. Doherty prize by the N.E.L.A. in 1926.

Reducing all costs to an annual basis, the following results were obtained:

Consumer cost, $13.18, including a part of the distribution cost.

Capacity cost:	
Generation and transmission	$94,193.00
Local distribution	39,575.10
Total (C)	$133,768.10
Energy cost	$27,841.42



CURVE SHOWING COST PER UNIT VERSUS USE OF ENERGY IN SMALL TOWN RATE OF THE IOWA RAILWAY & LIGHT CORPORATION

The inducement characteristic of the rate is very well shown by the rapidity with which the curve drops at reasonably small consumptions. The slope breaks of the curve caused by the block form are not markedly pronounced and indicate no greater departure from the ideal of strict equity than is made necessary by the belief that a pure demand and consumption rate is unworkable for small users of energy.

*"*Determining Demand Charges,*" by W. J. Greene,* ELECTRICAL WORLD, *Nov. 7, 1925, page 947.*

Capacity cost per kilovolt-ampere of peak load:

$$\$133{,}768.10 \div 1{,}160 = \$115.32 = C \div P$$

Energy cost per kilowatt-hour:

$$\$27{,}841.42 \div 1{,}499{,}075 = \$0.01857$$

Allocating the capacity cost by the consumption and demand elements gives

$$\frac{C}{P} \times \left(\frac{D-P}{8{,}760D-K}\right) = \$115.32 \times \left(\frac{5{,}293-1{,}160}{8{,}760 \times 5{,}293-1{,}499{,}075}\right)$$

$= \$0.01063$ per kilowatt-hour (k) used by a consumer and

$$\frac{C}{P} \times \left(\frac{8{,}760P-K}{8{,}760D-K}\right) = \$115.32 \times \left(\frac{8{,}760 \times 1{,}160-1{,}499{,}075}{8{,}760 \times 5{,}392-1{,}499{,}075}\right)$$

$= \$22.26$ per kilovolt-ampere (d) of consumer's demand.

Adding the consumption portion of the capacity cost to the energy cost ($0.01857 + $0.01063) gives $0.0292 per kilowatt-hour as the unit consumption cost.

Changing the figures to a monthly basis, the cost of serving a consumer in a town of less than 2,000 population equals $1.098 + 1.858d$ + $.0292$k$.

A rate for residence consumers has been worked out as follows:

The consumer charge has been made direct.

The demand charge for lights up to a demand of 750 watts was loaded on the first 20 kw.-hr. on the assumption that up to that limit all consumers will have substantially the same load factors. For consumers with small appliances that increase the maximum demand the demand portion of the extra capacity cost was loaded on the next 20 kw.-hr. The extra 1 cent per kilowatt-hour on the last rate is intended to cover the extra demand portion of capacity costs for ranges, etc. The rate was built up in this way to avoid the necessity of installing demand meters. The cost curve rate adopted was as follows: $1.10 consumer charge plus 9.9 cents per kilowatt-hour for the first 20 kw.-hr. used per month, 6.4 cents per kilowatt-hour for the next 20 kw.-hr. used per month, 4.0 cents per kilowatt-hour for all additional consumption per month.

This rate will return to the company all costs, including interest at a rate which represents the actual cost of money, an allowance for contingencies and a small allowance for profit on each dollar of costs. The rate is an inducement rate for the encouragement of a long hour use of light and appliances.

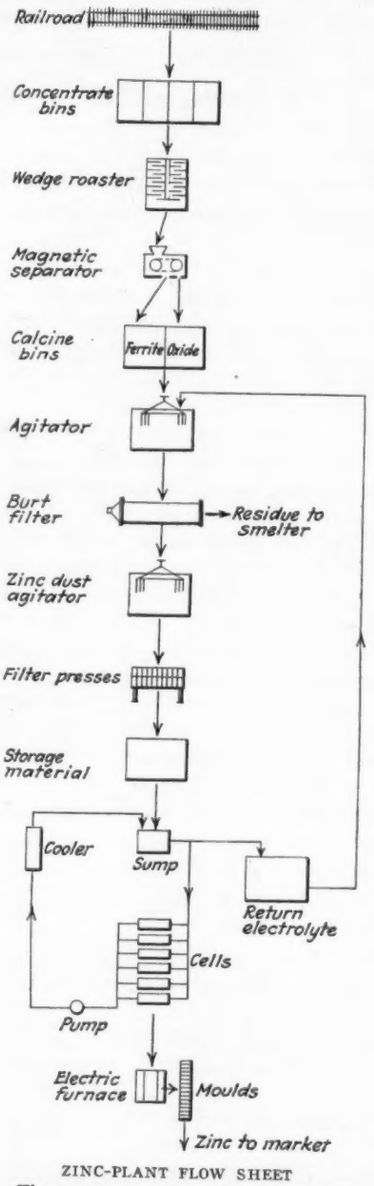
This rate has been put into effect as an ordinance rate in several towns and, with somewhat higher charges, as an optional rate in other towns. In some of the places, where it is offered as an optional rate in competition with the usual block meter rate with a minimum, it has been adopted by more than 80 per cent of the electric consumers.

The rates have been employed by this company for the past five years with very satisfactory results. Many consumers' complaints against high top block meter rates have been successfully answered by showing the consumer what the results would be with these cost curve rates and proving to him that he was either not paying the cost of his service, and therefore not entitled to a lower rate, or else was paying so much in excess of the cost as to be entitled to service at a lower rate, provided the company were guaranteed certain amounts regardless of the kilowatt-hours used.

Some may think the consumption and demand method of allocation a bit complicated; but the company finds the method very simple of application. The complications and difficulties encountered are in the present classification of accounts, none of which is adapted to cost allocations, requiring much detailed work in separating various items in order to arrive at the true total capacity costs that are to be allocated by the method here described.

New Electrolytic Process for Zinc Production

THE Sullivan Mining Company is constructing a plant in the Cœur d'Alene district of northern Idaho for the production of zinc by the Taintor-Print process. An ultimate output of 150 tons a day is anticipated from the three 50-ton units. This is the first commercial installation of this new process, characterized by the use of strong acid and high current density in the electrolysis.



ZINC-PLANT FLOW SHEET

The progress, through the Taintor-Print process, of the zinc ore received at the Sullivan Mining Company's new plant is shown. This new electrolytic method of zinc production produces a metal with an exceptionally high freedom from impurities.

The zinc concentrate will be roasted in Wedge furnaces and the calcine submitted to magnetic separation to cause a division between the zinc ferrite and zinc oxide. The zinc ferrite is soluble in acid of 10 per cent strength or over and is therefore added first to the return electrolyte, which carries about 28 per cent of free sulphuric acid. In this way the zinc ferrites may be decomposed, and when the acid strength is suitably reduced neutralization is completed with the zinc oxide portion. The pulp is then filtered in Burt filters and the solution agitated with zinc dust. This precipitates copper, cobalt and cadmium, after which the solution is filtered in presses and goes forward to the electrolysis.

Electrolysis is carried out at a cathode current density of 100 amp. per square foot and with a terminal voltage of about 3.5 volts. The zinc sheets, after stripping from the cathodes, go to the melting furnaces and the metal is cast into slabs which are of 99.99 per cent purity.

All power is purchased at a primary rate from the Washington Water Power Company and is changed to direct current by the use of motor-generator sets. Electric drives will be used throughout the new plant for all the material handling and processing. The diversity of uses to which electric energy is adapted in this plant is of particular interest.

Open the Door to Larger Sales

The "district representative" plan and its application. How sales of appliances and energy have increased by its uses. Pubic relations improved as business grows

By NORMAN T. WILCOX
Stone & Webster, Inc., Boston, Mass.

TWO major obstacles must be overcome before the central station can attain maximum sales of electrical service and the largest net income: (1) Lack of complete territorial canvassing and (2) the resistant attitude of the housewife toward door-to-door merchandising. But few companies show an average of $20 or more per home per year in energy-using household appliances. Until recently the average residence has used not more than a meager kilowatt-hour daily, costing about 8 cents. We should rightly expect to sell a service to the family that eventually will average at least 50 cents per day, because this service is equivalent to hired human labor valued at four to five times this amount. There are many elements in the problem of increasing domestic sales of merchandise and energy. Among these are trained salesmen, competent supervision, adequate and continuous support, promotional type rates with a single meter, simple but comprehensive reports, the co-operation of the entire electrical fraternity and the sale of the idea of complete service to the home occupant. We believe that the district representative plan, as developed and applied in several Stone & Webster companies, both gas and electric, is one of the most promising, practical and effective methods of opening the door of the home to larger sales that so far has come to our attention. This plan has been undergoing a gradual development for several years and is now gradually being put into effect on most of our properties.

WINDOW DISPLAY INTENDED TO ACQUAINT CUSTOMERS WITH DISTRICT REPRESENTATIVES

Under this plan the entire residence territory served by a company is divided into districts of 800 to 1,000 homes, each served by one man, known as the district representative, or the "D.R." for short. The D.R. reads all meters, sells and inspects domestic appliances, handles complaints and rectifies minor troubles. He also collects overdue accounts in his territory, thus taking the place of several men from separate departments formerly performing these functions.

Contrary to some predictions, experience proves that customers do not look upon the D.R. as a salesman, but welcome his advice and assistance, generally consulting him in regard to possible purchases. Systematic and frequent customer contacts made by the D.R. materially increase the rate of appliance sales and also restore many "on-the-shelf" devices to actual service with resulting customer satisfaction and increased sales of energy.

The following outline of the experience of one of the Stone & Webster companies with the D.R. plan concerns a light and power utility that was making exceptionally large sales per customer even before the plan was adopted. The plan has been in complete operation with this company since Jan. 1, 1926. Prior to the adoption of the plan it was becoming more and more difficult rapidly to increase and adequately to develop the business. Previous to the adoption of the plan the sales department consisted of some general salesmen, specialty salesmen, service men and others; also the usual meter readers, collectors, trouble men, complaint adjusters, etc., each function being performed by one of a group of employees. As it was at first necessary for the representatives to acquaint themselves thoroughly with their territories and customers, but little selling was done in the first three months, so that the more than $20 sales per residence attained per year followed a little more than nine months' selling effort.

Under this plan electric refrigeration and cookery experts are available and when necessary are called in to assist or close sales.

SELECTION OF REPRESENTATIVES

The men were carefully chosen, and in ability are at least equal to a good type of insurance solicitor. Before being put in charge of their districts, the men were thoroughly instructed as to company policies and as to the service of the organization. Experience in actual operation of the plan indicates that the various objections that have been raised against it have been overcome or do not materialize.

It was first determined that a representative could easily read from 40 to 50 meters a day, at the same time calling on the customers inquiring about the service, getting acquainted and gradually working up an interest in sales. It was decided to do all the meter reading during eighteen days of each month. This left Saturdays

and several days at the end of the month available for the D.R. to complete his knowledge of customer needs and possibilities and for the representative to attend to odd jobs and special work.

The company's territory was divided into nine districts. In these the areas differ greatly, but the number of customers is about the same. Some office changes in meter-reading record handling, billing, etc., were required.

From the outset it was realized that the D.R. must possess good personality, be capable of learning the work quickly and be thoroughly imbued with the idea of service first. The nine representatives selected during the fall of 1925 consisted of one meter reader, two salesmen, one stock clerk, one collector and four new men. One of the salesmen was made assistant sales manager and supervisor of the six D.R.'s who worked out of the main office. Another experienced salesman was made supervisor of the three D.R.'s working out of another office. During the training period weekly meetings were held at which the company's manager and various department heads carefully explained the problems of the organization in order that the men might have the benefit of a broad understanding of the company's business and policies. The men were made responsible to the assistant treasurer in regard to meter readings and collections.

Preparing the Customer

Properly to inform the public concerning the new system, letters containing the photograph of the district representative and an explanation of the plan were mailed to all customers in time to reach them two or three days before the D.R. would call to obtain the January meter reading. A complete description of the plan was also published in the January issue of the quarterly publication which the company sends to all customers, and further explanatory articles were published in the press. The booklet describing the D.R. plan carried a halftone of the local D.R. for the particular district concerned, set forth the purposes of the plan, uses and costs of electric service (gas is included in combination companies) and data on cooking, home lighting, refrigeration and convenience outlets.

Results Obtained

The proportion of the D.R.'s time properly chargeable to sales and servicing has been found to be 40 per cent for sales, 15 per cent for servicing, and 30 and 15 per cent respectively for meter reading and collections.

Under the D.R. plan the number of employees calling upon the customer has been reduced from five to ten down to one. A personal relationship has been developed between the customer and the company that was not possible previously. Meter readings are more regularly made, because the customer, knowing and trusting the D.R., will often tell him how to get into the house when no one is at home. Experience has shown that the customers actually look upon the sales feature of these relations as a service and do not feel that they are being approached with any ulterior sales purpose. As the D.R. possesses some authority, he feels that he is more than an ordinary cog in the machine and is more interested in his job. Representatives are instructed after reading meters to try, if practicable, to call upon the lady of the house and inquire if everything is all right, whether there are any appliances not operating which he can repair, etc. In this way a large number of minor repairs are made which the customer would not ordinarily trouble to bring in. This increases kilowatt-hour sales. Many minor complaints are cared for by the plan, as the customer feels more free to discuss them with the D.R. and knows that he will do his best to dispose of them fairly.

As the D.R. becomes familiar with the customer's credit and has to handle overdue accounts, he tends to prevent the taking on of many bad merchandise accounts. This is evidenced by the small number of reverts and very low losses from bad accounts. The D.R. is also often able to obtain money where an ordinary collector fails. In cases where the customer is temporarily unable to pay we find that he is more apt to give an honest reason to the D.R. than he would to a collector.

The monthly necessity of meter reading gives the D.R. a favorable entrance into the home. Representatives are cautioned not to abuse this privilege or to overemphasize sales. This is particularly important in the first few months of operation. Once this acquaintanceship has been established, it is easy for the representatives tactfully to work up an interest in electrical appliances. He soon learns what appliances the customer owns, and, knowing family conditions, can intelligently guide sales effort.

Under the D.R. plan we have developed a real market survey covering practically 100 per cent of our customers and including in each case a knowledge of the appliances that should be sold. The D.R. is forced by the plan to come into regular contact each day with a definite num-

District Representatives Obtain Results in Abington and Rockland

(*Population approximately 14,000*)

DISTRICT REPRESENTATIVE plan put in full operation Jan. 1, 1926.

Kilowatt-hours per residence customer in 1925, 337.7.

Kilowatt-hours per residence customer in 1926, 361.2.

Kilowatt-hours per residence customer in 1927, over 400.

Total merchandise sales in 1926, $132,112.

Average number of customers in 1926, 6,397.

Merchandise sales per residential customer, 1926, $20.70.

Losses on merchandise in 1926, about 0.2 per cent of bills outstanding.

Wiring jobs not included in sales, but averaged at least $1 per residence customer.

Radio sets not sold, but a few motors included in supplies.

Reverts were practically nil.

Trouble calls were 400 per cent greater in June to September, 1926, than in same period of 1927 (another S. & W. property).

In last six months one Abington & Rockland "D.R." sold monthly $2,228 worth of merchandise, regularly read 800 meters and, besides collecting delinquent accounts, serviced appliances more than one hour per day.

ber of prospects. This is very important, since it is well known in sales activities that if the salesman will get out and make enough calls, larger sales will result. The plan is about as near automatic selling as any plan could be. There is enough variety in the work to keep the D.R. from "going stale," and in fact it proves stimulating.

In the pioneer company all D.R.'s are on a salary basis, the range being from $1,500 to $1,800, supervisors being paid from $1,900 to $2,400. Some of our companies are experimenting with the salary plus commission plan to obtain a basis of comparison for future guidance.

This year all district representatives are actively selling refrigeration, but some special refrigeration salesmen and all installers are being retained. The number of special refrigeration salesmen has been reduced 50 per cent.

On Jan. 1, 1927, this plan was put into effect in a combination company serving more than 70,000 home meters, half of which are electric. This company operates largely in congested city districts, each D.R. handling from 1,800 to 2,000 meters, or from 900 to 1,000 homes each. Preliminary reports indicate that the D.R. plan is proving most advantageous despite the contentions of many that the plan is mainly adapted to companies serving suburban small town and rural territory. Time will be required to yield full operating data on this plan, but reports thus far advanced indicate material improvement in both public and customer relations, as well as in sales. Data from the Electric Light & Power Company of Abington and Rockland (Mass.) are given in the accompanying panel.

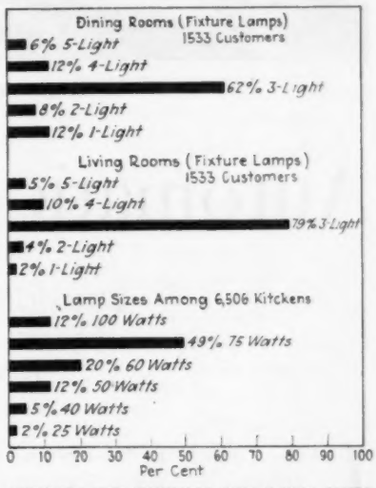
All of the New England gas, electric and combination companies under the management of Stone & Webster, Inc., have adopted this system, and a number of companies run by this organization outside New England are also using it. The results in the way of better public relations would warrant the expenditure of a considerable sum of money to introduce this system. Meter reading by competent people is the key to the situation, and adequate supervision affords the assurance of results.

Night Lighting of Homes for Sale

THREE 500-watt floodlights sufficed to illuminate this unit of a "Home Beautiful Show" recently conducted in Fall River, Mass. This house was visited by 21,000 persons in one week. Two lighting units are on the front, one on the right side, and two 300-watt lamps are on the left-hand side (not shown). The lighting installation was designed by the Fall River Electric Light Company.

Finds Wage Earners Are Good Appliance Prospects

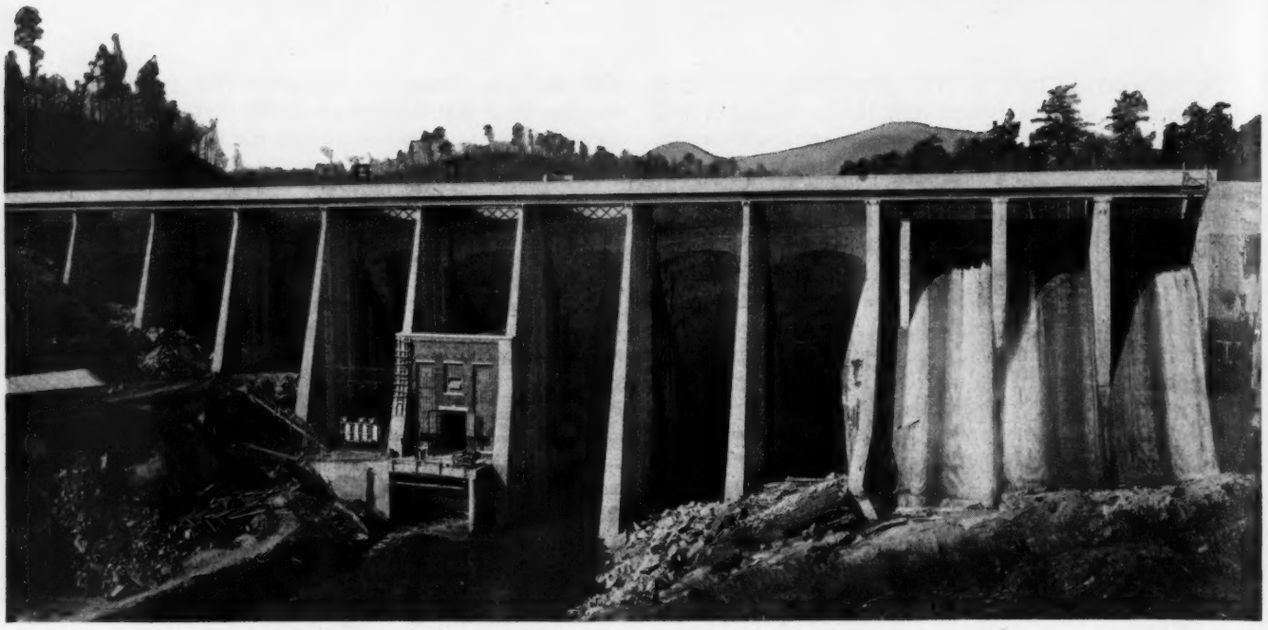
FROM a four months' survey of typical wage-earner residential streets the Worcester Electric Light Company has recently found that 93 per cent of the homes visited own electric irons, 40 per cent have toasters and 20 per cent have kitchen lighting fixtures of modern design. These figures were deduced from 6,506 calls upon customers who reported their appliance equipment to the sales department investigator. The company representative was equipped to make minor repairs and adjustments of domestic appliances, carried lamps and made about 100 kitchen lighting unit sales in the course of his inquiries. The accompanying diagram shows the distribution of lamp sizes found in the kitchen installations. The survey was conducted by Edwin Mandeville. As the survey progressed it was decided to increase the data sought from each customer and in 4,858 completed calls it was found that 24 per cent of the customers owned vacuum cleaners, 11 per cent washing machines, 4 per cent radio chargers and eliminators and 1 per cent each for hot plates, waffle irons, curling irons, sewing machine motors, percolators and grills. The present saturation of this class of customers is very low in refrigerators, ranges, pumps, fireless cookers, pianos, victrolas, fans, heaters, pads and oil burners, only 1 per cent of the homes covered in the 4,858 calls being represented in the combined totals of these last-named appliances.



SOCKETS PER FIXTURE AND LAMP SIZES IN WAGE EARNERS' HOMES

During the survey 1,533 calls were made in which the number of lamps used in living and dining room fixtures were counted. In each class of room three-light fixtures predominated, four-light fixtures coming second in order of number installed.

The importance of increasing the wattage of kitchen lighting installations was brought out by the survey. The fact that 20 per cent of the 6,506 customers called upon possess kitchen lighting units of modern design affords gratifying evidence that this type of lighting has proved highly acceptable to wage earners, and that 61 per cent of the modern installations use 75 and 100-watt lamps despite the temptation to purchase smaller units when replacing burned-out lamps is encouraging. All of the data secured indicate that the saturation point in household appliance and lighting service is far from being closely approached, and it is believed that the conditions in Worcester apply to many other cities with a large industrial population.



POWER HOUSE AND SWITCHING STATION IN DOWNSTREAM FACE OF LAKE LURE DAM

Automatic Hydro Holds Lake Level

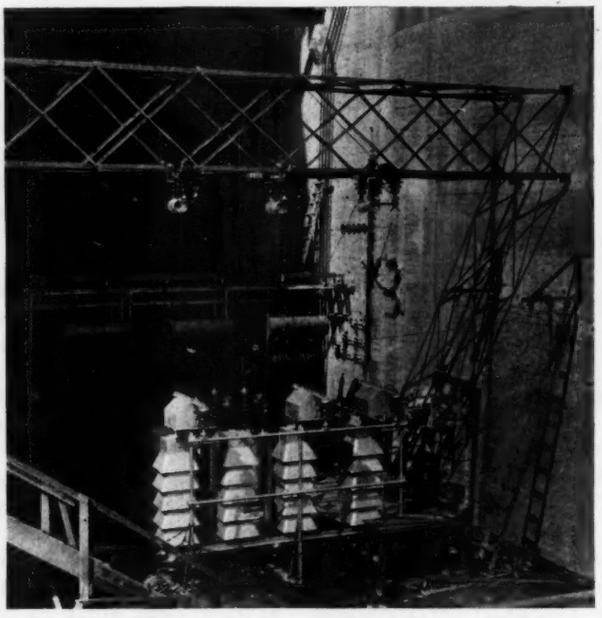
Electricity generated to carry investment charges on dam. Energy sold on dump power basis to Blue Ridge utility. Resort expected to consume output ultimately

LAKE LURE hydro-electric plant of the Carolina Mountains Power Company, on the Rocky Broad River, just below Chimney Rock, N. C., was developed chiefly to create a scenic lake for a resort, electricity being generated to carry the investment of the 504-ft. dam that provides a head of 104 ft. The lake formed has an area of about 1,000 acres and will be maintained at practically uniform level under all stream flow conditions. A drainage area of about 98 square miles exists.

The entire output, estimated at 13,500,000 kw.-hr. at the switchboard per average year, is being sold on a dump power basis to the Blue Ridge Power Company under a ten-year contract at ½ cent per kilowatt-hour. Thereafter it is expected that the resort will consume the output. The Lake Lure plant is equipped for automatic operation under the remote control of the Turner station of the Blue Ridge Power Company, 7 miles away.

The automatic hydro plant is equipped at present with two 2,300-volt generators, one rated at 1,500 kva. and the other one at 3,000 kva., these units being driven by 514-r.p.m. and 360-r.p.m. turbines respectively. A third unit rated at 3,000 kva. may be installed some time in the future, depending on the load factor.

The principal section of the dam is of the multiple arch type containing ten spans (41 ft. from center to center). The spillway section is of the cyclopean concrete gravity type, and the tie section is of earth embankment hydraulically placed. Flood control is obtained with three 16x25-ft. electrically operated Tainter gates manually controlled. A trash gate is provided, and emergency overflow is permitted over certain arch sections.



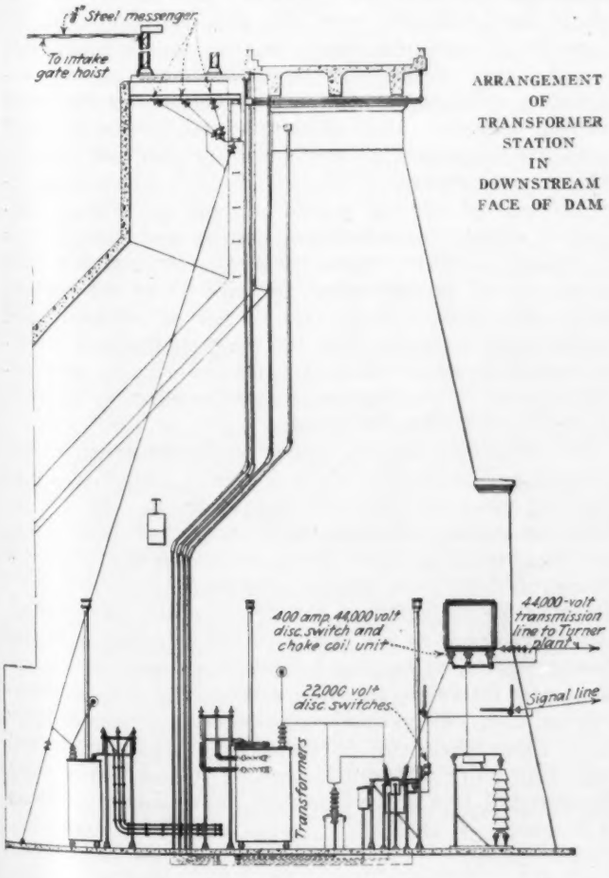
SUBSTATION BUILT IN ONE OF THE ARCH SECTIONS OF DAM

Normal lake level is maintained by float switch control of the turbines; a 6-in. variation of the lake level is allowed. Throughout the upper 3-in. range both generators are run, and during the lower 3-in. range only one unit is employed. The intake consists of a cylindrical tower and manifold with an electrically operated cylindrical type head gate. Electrically operated butterfly valves are used to control the units.

Remote control from the Turner station is effected as follows:

CYLINDRICAL TYPE HEADGATE OPERATED BY MOTOR

After a fifteen-minute warning float switch and battery control to a master relay initiates the starting sequence, which goes through all steps until energy is supplied to the system under voltage regulator control. In case of low water level the plant will shut down after a fifteen-minute warning. Protection features include a complete selective shutdown and lockout with visual indication in the Turner station showing what caused the shutdown.


⅜" Steel messenger
To intake gate hoist
400 amp. 44,000 volt disc. switch and choke coil unit
44,000-volt transmission line to Turner plant
22,000 volt disc. switches
Signal line
Transformers

ARRANGEMENT OF TRANSFORMER STATION IN DOWNSTREAM FACE OF DAM

Protection is provided against hot bearings, low governor oil pressure, loss of field, battery failure, reversed phase and insulation failure. The plant will shut down temporarily on account of low voltage, overvoltage, overspeed and thermal overload from any cause, automatically restarting after the trouble has been eliminated.

A 44,000-volt line has been built to the Turner station and an 18-mile line loops around the resort for distribution service.

Mees & Mees, consulting engineers, of Charlotte, N. C., designed and supervised the construction of the dam, power house and transmission and distribution systems.

Selling Street Lighting

Suggestions for effective merchandising of this service offered by National Electric Light Association committee. Co-operation of public urged

THE value and desirability of increasing the amount of current used for street-lighting purposes are hardly questionable, for this load will fill the valley in the load curve for night hours without contributing to a major extent to the evening rush hour peak. The street and highway lighting committee of the National Electric Light Association, in its 1927 report, gives several suggestions for properly developing this type of load. Indefinite allocation within the company of the responsibility for handling this business, mistaken impressions that street lighting is not a salable commodity, uneconomic and inequitable street-lighting rates, lack of definite financial policies for carrying on this work and a general lack of appreciation of the value of the street-lighting load and its characteristics are credited with being the main deterrent factors so far as present conditions are concerned.

Among the suggestions offered by this committee as important steps and elements in the effective merchandising of street-lighting service are the following:

1. Street lighting is a salable commodity and the installation of an effective street-lighting system is the logical approach to better window lighting, to increased intensities in store illumination and to more and better street lighting in other communities, which latter in turn start a new cycle of complementary activity.

2. The interests of the public require that street illumination be many times greater than the present values and at least twice the present average expenditures are justified on this basis. It is stated that in the average American city an annual expenditure of not less than $2 per capita is justified for this service by decreases in accidents and crime and increased convenience of urban life and property values.

3. The commercial department should be responsible for the sale of street-lighting service. A division of this department should be equipped with up-to-the-minute service on street-lighting problems. The advantages of street lighting as a load and its value as a good-will builder should be appreciated by all central-station employees and kept before them at all times. Surveys of the possibilities of street-lighting developments should be made separately and in detail for each community served. This survey should include a determination of the individuals in each community who are best able to combine

an ability for leadership with an unselfish interest in civic advancement.

4. It should be demonstrated to each community that an ultimate plan definitely establishing all physical elements of a street-lighting system that will provide adequate street-lighting service, including satisfactory appearance, at a minimum cost consistent with such service should be effected. The subject of good street lighting should be kept before civic societies, business men's clubs, chambers of commerce, safety organizations and women's clubs. Newspapers should be sold and kept sold on the idea of good street lighting. Advertisements in newspapers should further the work. Window displays, exhibits and signs should be used by the utility company. Data indicating the value of effective highway illumination should be compiled for publicity purposes. Photographs illustrating to good advantage the before and after appearance of local highways that have been improved by the installation of proper lighting systems should be made.

Letters from Our Readers

How to Distinguish Between Progressive and Unprogressive Companies

To the Editor of the ELECTRICAL WORLD:

I read with considerable interest the letter printed in the ELECTRICAL WORLD for Oct. 22 from John S. Duffy. It is, I believe, fundamentally sound, because if you pay the same remuneration or return to a sleepy individual as you do to a progressive and active one, you tend to make the latter sleepy also, or he leaves you for a more progressive atmosphere. I believe that this is equally true of capital.

Your editorial note appears to agree with this point of view, but points out the difficulty it would create for the public service commissions inasmuch as they have not at the present time any usable yardstick with which to compare the two types of companies. It occurred to me that the total kilowatt-hours sold to domestic customers divided by the population of the locality served might form the base of such a yardstick.

An unprogressive company will give poor and unreliable service, will not make its customers familiar with electrical conveniences and will continue with obsolete rate methods. The progressive company, on the other hand, will give good service, will make its customers familiar with the satisfactory house conveniences available and will continually improve its rate structure so that it may be economically possible from both the customer's and the central station's standpoint for more and more electricity to be used. Under the first condition domestic customers cannot use any great number of kilowatt-hours per annum. Under the latter they will automatically use kilowatt-hours freely.

I submit that the suggestion has the merit of simplicity because the population is known and in any up-to-date system the total kilowatt-hours sold to domestic customers is also known, therefore the figures are readily available. The method would confine the calculation to domestic customers, eliminating the effect of isolated large users, and, from a public relationship standpoint, the service rendered to the domestic customer is of greater importance than the service rendered to the isolated large user. Finally, if an aggressive policy were adopted toward domestic customers, there would be, I believe, no doubt that commercial and industrial customers would receive the same treatment.

The Lincoln Meter Company, Ltd.,
Toronto, Ontario.

S. L. B. LINES,
Vice-President.

National Standardization

To the Editor of the ELECTRICAL WORLD:

The vision of a national standardization entertained by L. W. W. Morrow, as recorded in the Sept. 3 issue of the ELECTRICAL WORLD, must entitle him to the sincere praise and appreciation of the many who are trying to grasp the essentials of the standardization situation—its faint beginnings, its past history, its present diseases, its true mission, and the best methods to pursue at present and in future. His analysis will help all the practical idealists who are working more or less practically and more or less idealistically on this problem.

Some will be inclined to believe that the ultimate Utopia set forth by Mr. Morrow in chart and description is wholly desirable, but is not for this world, or at least not for this day and generation. Many will find nothing in history or in their best judgment to justify the challenging thought that by the scrapping of existing agencies and conventions—the present every-day orderliness of affairs—we can build from their ruins, or out of the chaos produced by their annihilation, an ideal or practical "government"—for such is the nature of standardization. It is, indeed, of the essence of government.

Perhaps it is through an intentional subordination or an insufficient conception by Mr. Morrow of the essentially governmental processes and nature of the whole standardization urge, use and usefulness that he comes to lay such great stress on a supposedly practicable contemporary millennium in standardization and envisions a revolution rather than evolution as the royal pathway thereto. Most of us will prefer—and this will include most present governmental agencies and most of their constituencies—a slower, more evolutionary readjustment of our not wholly ordered nor exactly disordered standardization house, and to approach perhaps a slightly different ideal, where, for instance, the democracy of governmental agencies along the present lines—city, state, federal, etc.—is not so obviously and academically set aside from the main channels of standardization, in which these agencies historically, unavoidably, properly, and for every one's security, now so strongly and purposefully run.

Mr. Morrow's article, meant to be constructive and stimulating, certainly is both. It will set all of us to thinking more actively and co-operatively. It will no doubt do much to convince the few who still believe that they can run aside from the main stream that they will do well to think more broadly, play more with the team—much as we all still love the delusive idea of standing alone and doing as we like. As Mr. Morrow says, industry, instead of lagging behind government and, as in some past instances, adopting a hindering, dog-between-legs attitude, will no doubt soon proceed along a broader front than heretofore to build both organization and procedure more adequately, because it now has a mind to work and sees an end in view—harmonious relations in business.

W. J. CANADA,
New York, N. Y. Electrical Field Secretary N.F.P.A.

Digest of Electrical Literature

Transmission, Substations and Distribution

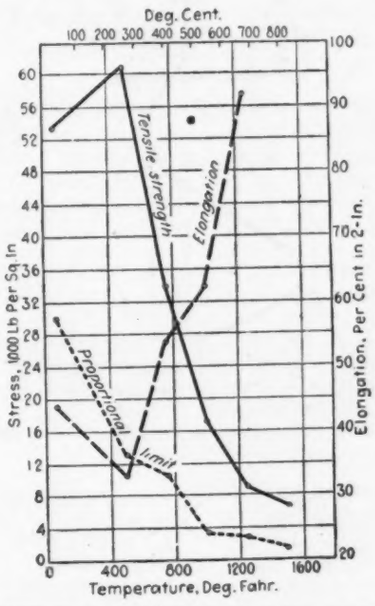
Condensers for Power-Factor Correction.—A review of general operating conditions and of the problems encountered in the installation of static condensers for power-factor correction, with the various types of electrical equipment. This article is one of a series which will offer a complete résumé of the subject. The elementary vector diagrams and a discussion of the desirability and value of accomplishing this work are given. Examples of specific installations which have yielded satisfactory results are offered in this installment—*Engineer (England)*, Sept. 9, 1927.

Mechanical Forces in Transformers.—W. S. Moody and A. Boyajian.—The authors have endeavored to discuss the origin and magnitude of the forces developed in transformers. The stresses have been divided into radial and axial classes, and the effect of dissymmetry is considered. The importance of sturdy insulation is developed. The permissible duration of short circuits and the relation of this factor to the mechanical strength of the transformer is clearly pointed out. The strongest possible transformer cannot be left on short-circuit current at rated primary voltage for an indefinite period of time because of the ensuing excessive heating. The usual guarantee for transformers covers a duration of two to five seconds, depending upon the per cent reactance of the transformer. The higher the reactance the longer the permissible duration for the same ultimate temperature rise under short circuit. Two seconds is considered to offer an adequate interval for the operation of automatic circuit breakers, and should these devices fail to operate the copper softens rapidly and eventually will melt under such conditions.—*General Electric Review*, Sept. 1927.

Hydro-Electric Development and Steam Equipment

Conductivity Methods of Measuring Condenser Leakage.—Henry C. Parker and Willard N. Greer.—The authors state that in an accurate determination of condenser leakage by conductivity measurements three quantities have to be determined—the conductance of the condensate, the conductance of a condensed steam sample and the corrected conductance of a 1 per cent solution of circulating water. The latter value may be calculated with sufficient accuracy from a measurement of the conductance of the circulating water. The conductance of the condensed-steam samples may be plotted as a function of the load, and approximate values of this quantity may be subsequently read from this curve. The procedure for collecting condensed steam samples which will be free from contamination and leakage is indicated, and a special apparatus has been developed for this purpose. Wiring diagrams of suggested devices for the most satisfactorily consummation of the desired result, sample calculations and operating data obtained as the result of suggested procedures are given. A number of tests for determining the reliability of leakage measurement have been included in the text.—*Power*, Sept. 27, 1927.

Properties of Boiler Tubing at Elevated Temperatures Determined by Expansion Tests.—A. E. White and C. L. Clark.—The object of this investigation was to determine safe working loads for low-carbon-steel seamless tubing at elevated temperatures. Present-day boiler practice employs temperatures varying from 550 deg. to 750 deg. F. and pressures approximating 350 lb. per square inch. There is an increasing tendency to raise both temperature and pressure, but comparatively little information is available concerning the properties of metals at elevated temperatures, particularly when temperatures are maintained for long periods of time. It has been the endeavor of the authors to correct, in a measure, the inadequacy of previous information on this subject. The investigation sets forth preliminary findings on 0.13 carbon-steel tubing when loaded at temperatures of 900, 1,000, 1,250 and 1,500 deg. F. The accompanying figure illustrates the changes which take place as determined in the present investigation.—*Mechanical Engineering*, October, 1927.



PROPERTIES OF 0.13 CARBON STEEL AT ELEVATED TEMPERATURES (SHORT TIME TESTS)

Units, Measurements and Instruments

Measurement of Impulse Voltages.—H. Muller.—Theoretical and practical research work carried on during the last ten years has indicated the important effect of impulse voltages upon the insulation of high-voltage apparatus, culminating finally in the adoption of the so-called impulse test as a standard testing method for generators and transformers. This made it necessary to devise methods whereby impulse potentials can be readily and accurately measured either mathematically or oscillographically. The author describes in this paper the Binder and Lecher methods, the klydonograph and the Dufour cathode-ray oscillograph, and mathematical methods of K. W. Wagner and M. Toepler.—*Elektrotechnik und Maschinenbau*, July 31, 1927.

Some Notes on a Fork Frequency Meter.—E. Mallett.—The possibility of securing greater accuracy in indicating frequency meters is considered. Two types of distortions are recognized by the author as occurring in the resonance curves of reeds and forks, one being due to coupled circuit effects and the other to large amplitudes. The reaction on the driving circuits and the changes in impedance with the frequency are referred to by the author. The inherent difficulty attending an endeavor to reduce the frequency to 50 cycles per second is illustrated and developed by mathematical means. Some suggestions have been made for the accurate measurement of frequency at a particular value by the use of the changes of impedance in the exciting coil of an electrically driven tuning fork. Measurements made in this way have been found of considerable value in the laboratory. An alternator or oscillator can be set to a desired frequency with great accuracy by simply arranging that the current through the coil, or the voltage across it, has the same value when the force is vibrated freely as when it is damped by the finger. A number of suggestions have been made for the production, on the same lines, of a commercial instrument for general use.—*World Power (England)*, September, 1927.

Motors and Control

A Large Low-Speed Alternator.—Particulars of a large electric generator installed in the Neuhof power station in Hamburg are contained in this article. The machine is of massive construction and generates current at a potential of 6,300 volts, 50 cycles, at a speed of 94 r.p.m. The rotor is equipped with 64 poles, and as the over-all diameter of the machine approximates 27 ft., this part has of necessity been constructed in four sections clamped together by

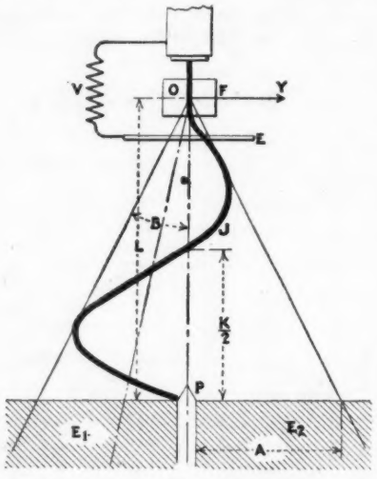
shrunk rings and twelve bolts, while the poles are held in position by a number of long screws. The pole core pieces are composed of cast steel while the pole shoes consist of laminations held in dovetailed grooves and bolted to the cores from the inside, the shape of the shoes being such that the voltage curve has practically a sinusoidal form. Bars in the shoes and two rings on each side of the poles constitute the compensating windings, and in order to facilitate the removal of any one of the poles, the compensating rings are subdivided. The pole windings consist of bare copper wound edgewise with paper insulations between the layers, the windings being firmly pressed together and carried on an iron belt which slips over the pole so that by loosening a few screws and connections a complete pole winding can be removed and replaced by another in a very short space of time. The low-speed characteristics incorporated in this machine were rendered desirable by the Diesel engine unit supplying the driving force.—*Engineer (England)*, Sept. 16, 1927.

Heat Applications and Material Handling

Alloy Welding Processes.—A new type of welding equipment utilizing three-phase power has been devised. Former applications of three-phase alternating current to welding processes drew the supply from one phase of the system. In this improved method two of the phases are connected to a twin electrode consisting of two rods insulated from one another, while the third phase is connected to the work directly. A rotating arc is formed between the electrodes and the work, and only one phase gives zero current at any instant. Apart from the fact that the system balances the load on the circuit, which is an advantage from the utility engineer's point of view, it has been found that the open-circuit voltage can be considerably reduced and that the power factor is greatly improved. It is said to be possible to strike and maintain the arc with an open-circuit pressure as low as 35 volts, while the voltage across the arc is only 25 volts. From the points of view of safety and the rate at which the metal can be deposited, the system, it is claimed, offers considerable advantages, because one operator can deposit twice as much metal in a given time as can be accomplished with the use of a single electrode. The three-phase arc is also said to maintain a practically constant temperature and to keep the gases in the space between the electrodes and the work in a state of permanent ionization, thus increasing the conductivity of the arc and reducing the required voltage. To prevent the maintenance of an arc between the rods forming the twin electrodes a small switch is provided, connected to a three-pole contactor. This when opened disconnects all the welding cables. In operation the welder opens the switch at the same instant that he draws the electrodes away from the work. —*Engineer (England)*, Sept. 9, 1927.

Electrophysics, Electrochemistry and Batteries

Development of the Jet-Wave Rectifier.—JUL. HARTMANN.—The jet-wave rectifier is a mechanical device based upon a principle discovered some twenty years ago. The essential part of the rectifier is the jet-wave commutator, and the main member of the latter is one or more wave-shaped mercury jets, the so-called jet waves. This device has been developed in recent years, the principal object of the work undertaken being to produce a single-jet commutator of as high a capacity as possible for the highest possible voltage or current. At the present time single-jet commutators for 30-40 kw. at about 180 volts direct current have been developed. By means of three such commutators working in series, a 100-kw., 550-volt, six-phase



SCHEMATIC DIAGRAM ILLUSTRATING PRINCIPLE OF JET-WAVE RECTIFIER

rectifier was produced in the course of the research work. The efficiency of this rectifier, not including the transformer, was about 92 per cent at maximum load. The commutators are characterized by an absolutely definite coupling between the alternating voltage to be rectified and the mechanical movement which effects the rectification. On this account they may be described as perfectly stable systems mechanically. The principle on which these rectifiers operate may best be described by reference to the accompanying figure. A mercury jet J passes through a constant magnetic field F. Through that part of the jet which at any moment is located within the field an alternating current, the auxiliary current, is transmitted. The alternating current is supplied by a transformer V and is led into it and out of the jet through the jet pipe and a special electrode E, the auxiliary electrode. The characteristics of the jet wave are such that the amplitude equals A, the tangent of the angle B. E_1 and E_2 are two parts of a double electrode separated by an insulating barrier P. The wave length is represented by K. The interaction between the field and the alternating current produces a mechanical force which, in the main, is perpendicular both to the axis of the jet and to the lines of flux in the field. It will give the part of the jet which is just passing through the field a deviation from the original direction of movement, the magnitude and direction of which is determined by the intensity of the current during the passage. As the current varies periodically, the consecutive particles of the jet must obviously be emitted along a line oscillating to and fro like the rod of a pendulum. The particles may be compared with the projectiles from a machine gun the barrel of which is kept vibrating during the firing. The projectiles from a gun under these conditions would arrange themselves along a wave line. The particles of the mercury jet will behave in much the same way, but will form a continuous conductor.—*Engineering (England)*, Sept. 9, 1927.

Traction

Current Collection from an Overhead Contact System Applied to Railroad Operation.—S. M. VIELE.—Pantographic current collection is discussed from a non-mathematical viewpoint, and certain factors which should enter into the design of an overhead contact system on an electrified railroad are considered. Certain desirable features, mechanical and structural, are emphasized and the practical limits which conditions permit in regard to the attainment of these features are indicated. The results of records made by the Pennsylvania Railroad with slow-motion photography have been outlined. These tests were made to determine operating conditions of the catenary construction with two different types of supporting attachments over both curved and tangent track. Deflections and oscillations were studied in order to bring out the most productive sources for future study and improvement of the design in respect both to elimination of wear and to maintenance of current collecting qualities. —*Journal of A.I.E.E.*, October, 1927.

4,000-Hp. Electric Locomotive.—F. GUBLER.—The new electric engines of the Paris-Orleans railway are described with particular reference to the motor and control equipment of these fast express locomotives. The machines are equipped with four direct-current motors, one above each of the driving axles. The motors are wound for the full overhead voltage of 1,500 and can be operated in series, series-parallel or parallel, resulting in continuous economic speeds between 9 miles and 56 miles per hour. Each motor can develop a one-hour rating of 1,000 hp. with heat not exceeding 120 deg. C. The motors are cooled with forced air. Operating the "Golden Arrow," the French crack train between Paris and Calais, these locomotives average 59 miles per hour and reach in daily service a top speed of 78 miles. Pulling a train of 560 tons, including weight of engine, over a distance of 75 miles, an energy consumption of but 28 watt-hours per ton-mile is required.—*Brown, Boveri Mitteilungen*, September, 1927.

News of the Industry

Utility Association Committee Will Not Lobby

In announcing the opening of its Washington office in the new Washington Building the Joint Committee of National Utility Associations has made public the following statement:

"The aim of the Washington office of this joint committee, besides keeping its principals informed as to government matters arising here, is to make available officially to the respective branches of the government the information, studies; engineering data, operating experience, etc., which the utilities possess or may secure relating to matters of mutual interest. The hope is that on this footing the joint committee may be able at least to assist in simplifying and perhaps even help in solving some of the problems involving the utilities, to the advantage of the government, the utility industry and the public generally.

"The joint committee has no lobby in Washington and employs no lobbyists. Its Washington office consists of a suite of six working offices in the Washington Building and employs engineering, legal and clerical assistance necessary for the purposes described."

Secretary Work's Colorado River Committee

Amid all the agitation over Boulder Dam and the Colorado River, with the Denver conference still in suspension, little has been heard of the fact-finding committee appointed after the Sixty-ninth Congress expired last spring by Secretary Hubert Work of the Department of the Interior. This committee included former Governor James G. Scrugham of Nevada, Governor Frank C. Emerson of Wyoming, James R. Garfield, former Secretary of the Interior; William F. Durand, professor emeritus of mechanical engineering at Stanford University, and United States Senator Charles W. Waterman of Colorado.

Secretary Work's advisers are expected to assemble in Washington the latter part of the month, at which time they will, it is thought, turn in their individual reports.

Alabama Power Company to Have New Steam Plant

The Alabama Power Company has filed with the Alabama Public Service Commission an application for a certificate of convenience and necessity to build a steam plant in the Warrior coal fields in Walker County, Ala. It is understood that the construction of the plant will begin in the near future and that the initial installation will consist of one unit of 50,000-kw. rating, though the plant will have an ultimate capacity of 200,000 kw. Work on the plant will begin as soon as possible. The cost of the initial unit will be approximately $5,000,000, and the plant when completed will represent an investment of about $20,000,000.

At the recent session of the Alabama Legislature a tax of 0.4 mill on each kilowatt-hour of hydro-electric power manufactured and sold was imposed. The same act increased the coal tax so that it is now 2½ cents per ton. One ton of coal, roughly speaking, will generate 2,000 kw.-hr. Thus the relation between the two taxes is as 2½ cents to 80 cents —a difference important enough to weigh in the decision to build the steam plant.

Power Board Not Against State Rights

Question Raised by the Tennessee Commission Does Not Embarrass Federal Body, Which Wants Closer Co-operation —Status of Various Projects

ANNOUNCED intention of the Tennessee Railroad and Public Utilities Commission to require applicants for power rights in that state to secure a certificate of convenience and necessity before applying for a preliminary permit in no way embarrasses the Federal Power Commission, the ELECTRICAL WORLD's Washington correspondent asserts. The federal commission is in no way interested in granting a preliminary permit to any one who cannot obtain state rights.

As a matter of fact, arrangements have been made for much closer co-operation between the federal commission and the State of Tennessee in the administration of the water-power act. O. C. Merrill, the executive secretary of the federal commission, has just returned to Washington from Nashville, where he conferred with the Tennessee Railroad and Utilities Commission. The Governor and the Attorney-General of the state attended the conference, at which the whole water-power situation in the state was considered. Hereafter, so as to determine which applicant for a preliminary permit is best qualified to undertake a development, the Tennessee commission expects to hold hearings in which a representative of the federal commission will participate.

R. D. Webb of Minden, La., has applied to the Federal Power Commission for a preliminary permit covering a project on the Lake Fork of the Gunnison River near Lake City, Col. He plans to construct a storage reservoir of 30,000 acre-feet capacity and to install 2,500 kw. The power is to be used for mining purposes.

A license probably will be granted at an early meeting of the commission to the Savannah River Electric Company covering a project at the Clark's Hill site on the Savannah River, 15 miles above Augusta. The work done by the company under its preliminary permit has been studied by the staff of the commission and has been approved. The Savannah company will build a 90-ft. dam, which will create a reservoir covering 40,000 acres. It is planned to install 120,000 hp.

Satisfactory progress is being made with the surveys on the Hill and Spencer project, which includes the Okefenokee Swamp in Florida. The present swamp area will be used as a reservoir. Power will be developed at the outlet and at two other points on the St. Mary's River. At first there were some misgivings as to the merit of the project, but they have virtually disappeared as the studies progressed. The company expects to be in a position within a year to apply for a license.

Hearing on Tennessee River Permits Postponed

Hearing of applications for water-power permits scheduled to be heard at Stearns, Ky., on Oct. 28 was postponed indefinitely by United States Engineer Lewis Watkins following announcement that representatives of the Federal Power Commission would sit in with the state commission on these projects.

Notice that H. A. Spalding will not push his application for a preliminary permit on the Big South Fork of the Cumberland River, on the Tennessee-Kentucky border, has been received at the offices of the United States district engineer in Nashville. This action, for which Mr. Spalding gave no reason, leaves only two applicants for permission to establish hydro-electric projects on the stream in the same locality—Edward Allen of Chicago and B. G. Slining, also of Chicago.

The Dixie Power & Light Company has filed an application with the Tennessee Railroad and Public Utilities Commission for a certificate of convenience and necessity for the develop-

ment of two hydro-electric power projects on Powell River. The application is the first to be filed with the commission, and accompanying the application is a copy of its declaration of intentions filed with the Federal Power Commission. The two dams proposed are a high dam at a point near King's Bend, in the Powell, and a smaller dam below the first at a point near Island Ford.

Squier Tells of Invention

His "Monophone," Attached to Electric Light Socket or Telephone Box and Energized from Lighting System, Will Reproduce Broadcast Radio Programs

ANNOUNCEMENT has been made by Major-General George O. Squier, U.S.A., retired, former chief signal officer of the army, of the invention by him of a new wired radio device or instrument which he calls the "monophone." This news was given to the corps of Washington newspaper correspondents last Saturday, coincident with the publication in the ELECTRICAL WORLD on that date of an interview by General Squier predicting the forthcoming use of electric light and power wires as well as telephone wires for broadcasting purposes. The monophone is designed to receive radio broadcasting programs by attaching it to the electric light socket or the telephone box. Loud speakers or head phones may be attached to the instrument as desired. The monophone is being developed by the Kellogg Switchboard & Supply Company of Chicago for telephone usage. It is now in operation in Freeport, Ill., and was demonstrated at the recent annual convention of independent telephone companies in Chicago. The monophone for use over electric light and power lines is being developed by the North American Company of New York City.

In making the foregoing announcemen General Squire said:

"An analysis of the situation, so far as wired radio is concerned, over existing wires, shows perfectly clearly that no matter which of the two sets of wires —telephone or power and light—there being already in 13,000,000 American homes, is used, the actual operation of the receiver set, which I have named the 'monophone,' in the home must come from the electric light and power socket, since the telephone wires carry no power. Therefore the monophone is designed to operate from the electric light and power lines of necessity, no matter whether the modulated high-frequency waves carrying the program in audible form are guided to the house by telephone wires or whether they are superimposed on the electric light and power wires. Whichever of these two networks carries the high frequency, it is delivered to the monophone, which operates without batteries of any kind, without any antenna system or unsightly loops and without any tuning devices.

"The monophone instrument itself reproduces the program from the modulated carrier wave and delivers it to the power-driven loud speaker, which may be as varied and as artistic as taste demands. One form of development is to make the loud speaker a separate instrument from the monophone, but I am not obliged to do this. For the moment, it seems to me, standardization is not desirable. A simple form of the monophone, and the one with which we are beginning, is a three-tube simplified radio set with a choice of three programs, operated on three separate wave lengths, each merely by pressing a button."

War Department Says Shoals Power Cannot Be Taxed

The War Department is convinced that Alabama has no right to tax the production of hydro-electric power at Muscle Shoals. To support its contention the department cites the ruling of the Supreme Court of the United States in McCulloch vs. Maryland and subsequent cases. In those decisions the Supreme Court held that instrumentalities of the federal government are not subject to state taxation. It has been suggested to the Alabama officials, however, that the subject will receive further consideration if they can show that the citations relied upon are not applicable.

Utility Association Counsel Ask Tax Reduction

Adding their testimony in behalf of tax reduction to that of numerous other representatives of business and industry, and advocating particularly a cut in the corporation income tax rate, Carl D. Jackson, general counsel of the National Electric Light Association and the American Gas Association, and Leslie Vickers, economist of the American Electric Railway Association, told the ways and means committee of the House of Representatives in Washington on Nov. 1 that lower taxes would benefit public utilities. Mr. Jackson said that the manufactured-gas industry pays 9 to 10 per cent of its gross revenue in taxes of all forms. No figures are available for the electrical industry, he said, but he thought that the same figure would be approximately correct in its case.

A tax reduction would be reflected ultimately in rates to the consumers, Mr. Jackson asserted, as regulatory bodies take taxes into account, the utilities acting more in the nature of collecting agencies for taxes paid by the consumers. A reduction in rates due to lowered taxes would mean more consumers and thus directly help the utilities. Mr. Vickers said that electric railways pay in all forms of taxation one and three-fourths as much as they distribute to their stockholders in dividends. Tax relief would make it possible for many of the electric roads to be revivified and to render better service, he said.

Against Moccasin Creek-San Francisco Line

Bureau of Governmental Research Calls Proposed Two-Million-Dollar Bond Issue Useless—Valuation of Private Distribution Systems Almost Finished

OPPOSITION to the proposed municipal bond issue for $2,000,000 to build a transmission line for Moccasin Creek power from Newark to San Francisco has manifested itself in that city. The San Francisco Bureau of Governmental Research puts the case against the expenditure as follows:

"The works to be built out of the proposed two-million-dollar bond issue, standing alone, would be useless. Plans for further works and expenditures necessary to launch the city into the business of power distribution are incomplete. The city engineer estimated $10,650,000 as the cost of a transmission line, step-down station and distribution system with standby service adequate for supplying the Municipal Railway power and lighting public buildings and streets. He pointed out that, under operating conditions which would apply to such a system, Municipal Railway power costs would be almost doubled, and that this would add at least $291,000 per year to Municipal Railway operating costs.

"Fifteen million dollars has been estimated by the city engineer as the cost of a 'skeleton' system for the same purposes and capable of future expansion into a city-wide power distribution system.

"The construction contemplated by the bond issue would duplicate existing privately owned facilities which are adequate for present needs and are stated to be capable of expansion. The proposed construction is considered in some quarters as having the possibility of jeopardizing the present contract between the city and the Pacific Gas & Electric Company for distribution of Moccasin Creek power, which contract is revocable on one day's notice by either party, and under which the city has received $4,870,000 during the 27 months that it has been in effect. This revenue has contributed $3,000,000 to the relief of the tax burden."

The end of three years' proceedings before the California Railroad Commission to set a valuation on the distribution systems within San Francisco owned by the Pacific Gas & Electric Company and the Great Western Power Company appears in sight. The proceedings were instituted by the city, which desires to purchase the properties that they may become part of the power system developed from the Hetch Hetchy project.

Final figures produced by John J. Daley, who is the city's counsel, indicate that the two power companies are asking almost three times as much for their property as the city believes it is worth. The combined figure for the two companies is $92,000,000, while the figure as placed by the city is $33,000,000. The chief difference of opinion lies

in the financial damage that the power concerns will suffer if their San Francisco property is severed from the rest of the system. Engineers for the Pacific Gas & Electric have testified that this loss to their company will total $34,000,000, while experts for the city believe $2,000,000 will cover this item. H. G. Butler, consulting engineer employed by the city, testified that this loss to the Great Western would be $3,300,000.

Chicago A.I.E.E. Meeting to Discuss 132-Kv. Cables

A symposium on the 132-kv. cables recently installed in Chicago and New York will be a prominent feature of the regional meeting of the American Institute of Electrical Engineers to be held in Chicago on Nov. 28-30. A student convention on the first day will take up problems of the district branches and conduct a students' technical session. The banquet will be held on Tuesday evening, Nov. 29. Following is the tentative program:

TUESDAY, NOVEMBER 29

Morning.—Symposium on 132-kv. single-conductor lead-covered cable: (a) "Introduction, Economics and Commercial Demand," Philip Torchio, New York Edison Company; (b) "Theory, Design and Development," L. Emanueli, Società Italiana Pirelli; (c) "Manufacture, Inspection and Testing," W. S. Clark, General Electric Company; (d) "Installation," A. H. Kehoe, United Electric Light & Power Company; C. H. Shaw and J. B. Noe, New York Edison Company, and D. W. Roper, Commonwealth Edison Company.

Afternoon.—"Illinois Central Electric Operating Experience," W. M. Vandersluis, Illinois Central Railroad; "Operating Experience with 125-Ton Storage-Battery Locomotive in Chicago Railroad Terminals," Edward Taylor, General Electric Company; "Operating Performance of Rectifiers," Cæsar Antoniono, Chicago, North Shore & Milwaukee Railroad; "Synchronous Motors for Steel-Mill Operation," W. T. Berkshire, General Electric Company.

WEDNESDAY, NOVEMBER 30

Morning.—"The Chicago Regional Power System," E. C. Williams, Public Service Company of Northern Illinois; "The Hall High-Speed Recorder," E. M. Tingley, Commonwealth Edison Company; "Relay Protection for Interconnected Systems," L. N. Crichton and H. E. Graves, Westinghouse Electric & Manufacturing Company "Alternator Characteristics Under Conditions Approaching Instability," J. F. H. Douglas and Edward W. Kane, Marquette University.

Afternoon.—"Developments in the Process of Manufacturing Lead-Covered Telephone Cable," C. D. Hart, Western Electric Company; "Telephone Toll Plant in the Chicago Region," Burke Smith and G. B. West, Illinois Bell Telephone Company; "The Vacuum-Tube Rectifier," J. H. Kuhlmann and J. P. Barton, University of Minnesota; "A Two-Range Vacuum-Tube Voltmeter," C. M. Jansky, Jr., and C. B. Feldman, University of Minnesota.

"Four-Billion-Candlepower" Projector Appears

On Tuesday evening of this week another stunt in spectacular electrical advertising was "pulled off" in New York City when the Capitol Theater, a motion-picture house, utilized a projector said to be rated at four billion candlepower to throw words in gigantic letters on the walls of skyscrapers in the vicinity. Letters 150 ft. high ran back and forth on walls three times that height and wide in proportion. When the message, which was said to be readable a mile away, was spelled out, it was found to be an injunction to attend the theater, which was celebrating its eighth anniversary. Eventually, the advertisers say, clouds and smoke screens as well as buildings are to be pressed into service as enormous billboards in this new field of electrical publicity. The Star Projector Company controls the device, which consists of a Sperry searchlamp, called the most powerful in existence, with lantern slides, which may later be replaced by giant motion-picture reels.

Condemns Unjust Tax on Public Utilities

West Virginia Association Protests Against Companies Paying Lion's Share for New Capitol—Proceedings of Two-Day Meeting at Parkersburg.

BEFORE the adjournment of the West Virginia Public Utilities Association's tenth annual convention, which, as briefly reported last week, met in Parkersburg on Oct. 26 and 27, a resolution was adopted condemning as morally unfair and economically unwise plans proposed in that state whereby a special tax which would fall almost exclusively on public utility property would be levied to complete the State Capitol at Charleston.

Approval of the attitude of the public utility companies operating in the state was expressed by Governor Gore of that commonwealth at the banquet on Wednesday evening. Governor Gore was preceded by J. F. Owens, vice-president of the Oklahoma Gas & Electric Company and chairman of the Public Relations National Section, N.E.L.A., who stressed the fundamental principles of American government in giving into the hands of individuals the conduct of business and declared that the government must at all costs be restrained from abandoning this principle.

At the business session on the first day W. J. Wiegel, editor of the Fairmont *West Virginian*, urged utility companies not to hesitate to take newspaper men into their confidence when withholding release of important information.

Paul S. Clapp, managing director of the N.E.L.A., told of problems confronting the electric light industry nationally and pointed out that modern facilities of communication are raising what would ordinarily be local difficulties in the industry to peaks of national significance. The plan of training employees of utilities for public contact followed by the Monongahela-West Penn Public Service Company was outlined by Robert Soule of Parkersburg.

An innovation in the convention program was the group luncheons held at noon on Wednesday. The women's committee luncheon, presided over by the state chairman, Miss Margaret Schneider, was addressed by Miss Isabel Davie of New York, secretary of the women's committee of the N.E.L.A.; Miss Esther Rockey of Dayton, Ohio, women's committee East Central Division, N.E.L.A., and Miss Fern Snider, Fairmont. The light and power group was presided over by A. Power of Huntington and characterized by a round-table discussion.

Reports from section and committee chairmen were heard on Thursday morning. W. F. Ficklen, Charleston division manager of the Appalachian Electric Power Company, gave information on customer ownership in West Virginia. W. A. Buchanan of Huntington answered the question, "Are the Public Utilities Lagging in Safety Work?"

Arthur M. Hill of Charleston was elected president, A. C. Spurr of Wheeling, W. F. Ficklen of Charleston and C. H. Hardesty of Fairmont vice-presidents; A. Bliss McCrum of Charleston was re-elected secretary, G. B. Moir of Charleston treasurer, and J. W. Cumming assistant treasurer.

Purchases and Mergers

The Eastern Vermont Public Utilities Corporation, which is said to have spent large sums on construction in Vermont during the war inflation period, has been sold at public auction for $550,000 to D. L. McDaniel of New York City. Mr. McDaniel declined to say to what use the property would be put and declared that he had made the purchase for himself and represented no other interests. The Eastern Vermont Public Utilities, formerly controlled by interests affiliated with the Hortonia Power Company of Rutland, has been in the receiver's hands for several years. It has hydro-electric plants at Barnet, Boltonville, Groton and West Danville and a transmission line connecting Danville, Ryegate and Bethel, all the places named being in Vermont. It is reported that G. L. Ohrstrom & Company are laying a transmission line from the plant at Molly's Falls to connect with the property sold.

Sale of the electric light and water plants of the Miami (Ariz.) Water & Power Company to the Peoples' Gas & Electric Company is announced. The consideration was $713,000 and the transaction is authorized by the Arizona Corporation Commission. The city has been operating the plants under lease during the last two years.

The Illinois Northern Utilities Company, Dixon, Ill., is asserted to be about to buy the Rochelle (Ill.) municipal lighting plant for $200,000.

The Danbury (Conn.) Power & Transportation Company has transferred the company's power house, transmission lines and tramway equipment to the Danbury & Bethel Gas & Electric Company under the terms of an agreement dated Aug. 12.

The New York Public Service Commission has approved the transfer by Fenton W. Barber of his electric light and power plant in Lewis, Essex County, to the Plattsburg Gas & Electric Company.

Sale by the Salamonia (Ind.) Light & Power Company of electric transmission lines to the Union City (Ind.) Electric Company for $11,000 has been approved by the Public Service Commission.

Bureau of Reclamation Power Projects

A Consistent Policy of Discontinuing Sale of Energy in Small Amounts Is Followed, the Bureau's Plants Being Leased or Power Sold at Wholesale

EVERY effort is being made by the Bureau of Reclamation to discontinue so far as it is practicable the sale of power in small amounts to towns or individuals. Wherever it is practicable to do so, the bureau's power plants or projects will be leased. If power is sold, every effort will be made to dispose of it at the switchboard to one company, district or other entity. The desire is to avoid the operation of transmission lines, but where that cannot be avoided the power is to be sold at wholesale. A brief review of the situation covering various reclamation projects is as follows:

Eventually the total capacity of the Black Canyon power plant on the Boise (Idaho) project will be required for pumping in connection with the operation of the Payette division. At present virtually the entire output is being leased to the Idaho Power Company and to the Gem Irrigation District.

The Boise River Power plant was built primarily to supply power for construction work on the Arrowrock Dam. Following the completion of the dam the plant was leased to the Electric Investment Company. The plant is now under lease to the Idaho Power Company, the successor of the Electric Investment Company, but is being used for standby service only. The power company has sufficient capacity of its own in that region and is not in a position to operate the Boise River plant continuously. Eventually the entire capacity of this plant will be required to pump water for the Hillcrest division of the Boise project.

Minidoka Project Typical

The bulk of the power from the Minidoka plant in Idaho is required for the operation of the project. During the non-irrigation season 3,500 kw. is sold for heating purposes, principally to the towns of Burley and Rupert. About 200 kw. is sold for commercial lighting and power purposes on a wholesale basis to various towns and mutual companies which operate their own distribution systems. In a few instances power is sold to individuals who are so situated as not to be served readily otherwise. On the Minidoka project the government is operating 148 miles of transmission line. The old power plants at American Falls which were acquired in connection with securing rights for the American Falls reservoir serve as standby plants when it is necessary to take one of the generating units out of service in the Minidoka plant. Those plants are obsolete, however, and are not suitable for continuous operation.

At the Lingle and Guernsey power plants on the North Platte project in Wyoming, 3,600 kw. of the 4,800 kw. capacity is sold under commercial contracts. Only 200 kw. is required for project use. It is believed that the Western Public Service Company and the Mountain States Power Company soon will be in a position to absorb the surplus. In connection with the Lingle plant 140 miles of transmission line is being operated to various municipalities, but in each case the power is sold at wholesale at transmission-line voltage. Each municipality has provided its own substation and distributing system. The Mountain States Power Company is taking 800 kw. at the busbars of the Guernsey plant and the company is building a transmission line from Guernsey to Casper. Negotiations are now in progress with the Western Public Service Company for the delivery at Scottsbluff, Neb., of 400 kw. from the Guernsey plant; that power would be delivered over a transmission line owned by the United States.

The town of Hot Springs, N. M., is negotiating for the power plant at Elephant Butte Dam on the Rio Grande project. The bureau would sell the power at the busbar and the municipality would provide the transmission line.

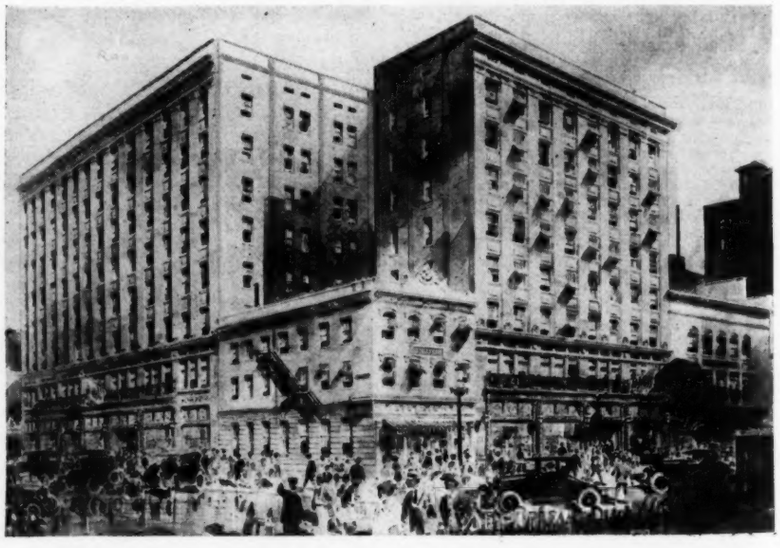
At the Pilot Butte power plant and the Riverton project in Wyoming the power is sold at wholesale to the Mountain States Power Company, which retails it in the town of Riverton. The company operates 8 miles of transmission line connecting its substation with the government line. The bureau operates the remaining 28 miles of the transmission line.

The surplus power from the Shoshone plant is being sold at wholesale to the Mountain States Power Company for distribution in Lovell and Byron, Wyo., to the towns of Powell and Deaver, Wyo., and to the Shoshone Electric Light & Power Company. In addition, power is being sold to the Oil Fields Power Company for distribution in the Oregon Basin oil field. Small amounts are being sold to the Chicago, Burlington & Quincy Railroad, for lighting and pumping at Cody, Wyo., and to four individuals.

The sale of electrical energy to other individuals already has been discontinued, and negotiations are under way for the leasing of the transmission line between Deaver and Crowley to the Crowley Gas & Electric Company. Negotiations also are under way for the purchase of power on a wholesale basis by the Mountain States company for distribution in Cody, Graybull, Basin and Worland, Wyo. When that contract goes through all of the surplus power will have been disposed of.

All of the surplus power developed at the Siphon plant on the Yuma (Ariz.) project is under contract to the Southern Sierras Power Company.

New Orleans Public Service Building Is Ready



THE new eight-story office building of Public Service, Inc., Baronne and Union Streets, New Orleans, has just become ready for occupancy. The company holds that, all told, it will be the best-equipped structure in the South devoted exclusively to housing a corporation. The difference between the new building and the former cramped quarters at Baronne and Common Streets is certainly striking.

The structure, which may ultimately be raised to twelve stories, is in modern Renaissance style, finished in buff Indiana limestone on the street fronts and light-buff pressed brick on the courts and for the party walls. Especial attention was given to the show windows and to the lighting system. The layout of the salesrooms, offices, departmental quarters, classrooms, restaurant and so forth follows a carefully studied architectural plan, and officers, employees and public will all be benefited.

Electrical Progress in Prairie Provinces

Calgary Power Company Reaching Out for New Business — Water-Power Possibilities in Saskatchewan—Hydro-Electric Plans for Manitoba

VIGOROUS campaigning for new light and power business is going on in the western Canadian Province of Alberta. The Calgary Power Company now has a series of towns in southern Alberta linked up and is reaching out after more. The Canadian Western Natural Gas, Light, Heat & Power Company is conducting a similar drive for business, and it, too, is meeting with success, with the combined result that numerous little centers of population are being transformed in respect to house and store lighting and also in respect to power facilities. Both companies have extensive plans for further development. The Spray Lakes hydro-electric power project, however, remains in abeyance.

Interesting facts regarding the water powers of the contiguous Province of Saskatchewan are contained in a report prepared by R. H. Blackburn, secretary of the Saskatchewan Power Resources Commission, who says in part:

"It is estimated that the total water power available at ordinary minimum flow is 514,451 hp., with a maximum possible development for at least six months of the year of 1,087,765 hp. Probably most of these powers are too far removed from present centers of population to be capable of economic development at the present time, but they will ultimately be of great value as the population moves northward. There are, however, a number of possible water-power sites on the North Saskatchewan River estimated, at an ordinary minimum flow, to have combined capacity of a little more than 75,000 hp., and it is quite possible it may be found that some at least of these might be capable of being economically developed in the near future. Owing to the great variation in the flow of the Saskatchewan River and the very limited storage, it does not seem practicable to develop these powers at the present time, except as part of a provincial-wide power scheme, but the possibility of utilizing these powers in conjunction with existing steam-electric plants in the province is worth careful investigation."

Mr. Blackburn says that the commission will inquire into these points. Upon its report doubtless will depend the next step of the government. Meantime, the Montreal Engineering Company and the Northern Light & Power Company in particular are going ahead consolidating here and there, scrapping little plants and making arrangements with the larger centers for a supply of power to be delivered at the city limits for distribution to these smaller communities.

Negotiations pending between the Calgary Power Company and the Power Resources Commission of Saskatchewan may result in the company taking over from the city of Prince Albert a half-completed power development at La Colle Falls, on the Saskatchewan River, where it is said that 40,000 hp. might be generated in the summer months, though in February the output would drop to 3,500 hp. It is estimated that about $4,000,000 will be required to complete the project. Proposals include transmission lines to Saskatoon, Regina and Moose Jaw as well as to Prince Albert, the line to the three cities first named to be rated at 132 kv.

Manitoba Enterprises

Further east an ambitious plan for a large power development and paper mill at White Mud Falls, on the Nelson River, in Manitoba has fallen through for the time being. A year ago a priority lease for the site was obtained by J. J. Menzies of Winnipeg, who made surveys and conducted negotiations looking to the building of a paper mill. They had not reached any form of finality when the power lease expired. Two brief extensions were made, with no definite result. The power site now reverts to the government.

Hydro-electric power is now being used in the development of Manitoba's mineral resources. The current has just been switched on over the 42-mile, 60,000 volt transmission line running from the Great Falls power plant of the Manitoba Power Company on the Winnipeg River. The Central Manitoba Mines are the first customer. Present power requirements by the mines are estimated at 1,500 hp., with every possibility of expansion of operations, including the San Antonio gold field.

Engineers representing the city of Winnipeg and the Manitoba government have gone to the Rainy River country to investigate in connection with the application of E. W. Backus of Minneapolis for storage rights in Rainy Lake and Namakan Lake. The Backus application has been before the International Joint Commission for about two years. The contention of the Backus interests is that Winnipeg's hydro power and all other power developments on the Winnipeg River would benefit by storage at the high lakes and should consequently share in the cost. The Winnipeg engineers claim that the Winnipeg River development companies would derive no advantage from the scheme. The Provinces of Manitoba and Ontario and the State of Minnesota are involved.

Ontario Government Against Raising Lake Levels

Ontario's provincial government will oppose the application of E. W. Backus of the Backus-Brooks Lumber Company for permission to raise the level of waters between Minnesota and Ontario. This decision is announced by the Canadian Minister of Lands and Forests. Civic, conservation, World War veterans and other organizations in Minnesota have also gone on record against the project.

Mr. Backus, who lives in Minneapolis, has filed application with the Canadian government to raise the level of lakes on the Minnesota-Ontario boundary from Rainy Lake east to North Lake by the construction of a series of dams and reservoirs. His plan is to utilize the increased flow of water in power projects, and he contends that danger of floods will be diminished rather than increased thereby.

Des Moines Company Makes Liberal Rural Terms

C. A. Leland, Jr., vice-president and general manager of the Des Moines (Iowa) Electric Light Company, has announced that an appropriation of between $100,000 and $150,000 will be made for the development of a new financial plan for rural electrification during the forthcoming year which will put electricity within reach of hundreds of central Iowa farms and make possible their utilization of electrical appliances. The company will pay an average of $350 a customer on the cost of extension of any transmission line owned by its subsidiary, the Iowa Light & Power Company. The territory to be served extends from Adel to Montezuma and Oskaloosa on the east. In many cases, Mr. Leland says, the company's appropriation covers the cost of the extension, but in other instances the cost runs to an average of $1,400 a mile and the system averages only two and a half customers to the mile. Heretofore the company has paid only from $50 to $75 a customer, placing the burden on the farmer, and in many cases the cost was prohibitive.

A new rate tariff is also being worked out which will give the patron consuming over 50 kw.-hr. a rate considerably lower than the city user. A rate of 7.5 cents a kilowatt-hour up to 50 kw.-hr. is charged and in excess of that amount the rate is cut to 3.5 cents. A monthly service charge, dependent upon the transformer used, will range from $3 to $4 for those users whose appliances are not larger than an electric stove, while those operating appliances such as heavy-duty motors and power units will pay from $5 to $7.

Northern Wisconsin Farmers Get Better Terms

Farmers and rural residents living reasonably close to the Lake Superior District Power Company's substations and transmission lines will soon have electric power and light at little more cost than do residents of cities, and sometimes at the same rate, according to an announcement just made by officials of that company. The former system, by which farmers paid for the extension of lines into their territory in addition to paying for the installation of transformers, has been abandoned, and in territories where there are from three and a half to four customers to the mile lines and transformers will be installed

free. The cost of energy will depend upon the amount that is used, but the new rate, according to the power company, is much more attractive from the consumer's point of view than the old charges. Farmers in the vicinity of Ashland, Wis., are eagerly awaiting the advent of lines into their territory. Construction in some districts has already been started.

Commercial Section Meeting of Wisconsin Association

On Nov. 17 and 18 the Commercial Section of the Wisconsin Utilities Association will meet at the Hotel Pfister, Milwaukee, and among the items on the program will be these:

THURSDAY, NOV. 17

Morning.—"Marketing Our Product," Frank A. Coffin, Milwaukee; "Growth of the Electric Refrigeration Load," Frank H. Evans, Wausau; "A Permanent Plan for Electrical Merchandising," E. C. Sorby, Beloit; "Co-operation with Dealers," John F. Martin, Ashland; "Speaking Our Piece," Fred E. Eriksen, Milwaukee.

Afternoon.—"Survey of Home Service in Wisconsin," Miss Alice Rentchler, Madison; "Better Customer Relations," J. J. Feeney, Madison; "Politics in Business," J. Victor Loewi, financial editor Milwaukee *Sentinel;* lighting committee report, O. J. Kruse, Milwaukee; power committee report, H. W. Beckwith, Lake Geneva; "Progress in Electrifying the Farms in Wisconsin," G. V. Rork, Owen.

FRIDAY, NOV. 18

Morning.—"Sidelights on a Range Campaign," Miss Arline Halblieb, Eau Claire; "Merchandising Results Obtained Through Co-operation of all Employees," Albert Smith, Chippewa Falls; "Developing Appliances to Meet Popular Demand," John A. Clark, Mansfield, Ohio; "Survey of Home Conveniences in Wisconsin," Mrs. Milton Griem, Wisconsin Federation of Women's Clubs.

R. F. Pack, vice-president Northern States Power Company, will be the chief speaker at the banquet.

Former Publisher and Owner of "Iron Age" Dies

David Williams, publisher and sole owner of the *Iron Age* from 1868 to 1909, died at his home at Rogers Rock, Lake George, N. Y., on Oct. 29, aged 85 years. He was born in Waterford, Ireland, and came with his parents to the United States in 1850, where he was graduated from the Middletown (N. Y.) Academy in 1857. His father, John Williams, began the publication at Middletown in 1855 of a trade journal known as the *Hardwareman's Newspaper,* which first appeared under its present name, the *Iron Age,* in April, 1859. The son succeeded to the ownership. He formed the David Williams Company in 1897 to publish this and other technical and trade journals and books and filled its presidency until his retirement eighteen years ago. He was a charter member and former vice-president of the Engineers' Club, former president of the American Trade Press Association and Federation of Trade Press Associations, a member of various other associations and clubs and an extensive traveler.

Kansas Municipal Officers Oppose Commission

Stripping the Kansas Public Service Commission of the regulatory powers now exercised by it over utility companies operating in that state and vesting such authority in the cities themselves is urged in a resolution passed by the League of Kansas Municipalities at its annual convention at Junction City recently. The resolution provides for the selection of a committee from the league to prepare appropriate legislation to this effect. The league, composed of city officials from virtually every section of the state, has been active for a number of years in the promotion of municipal ownership.

The resolution favoring "home rule" is said by league members to have resulted from the alleged inability or disinclination of the state commission to co-operate with cities in obtaining reasonable rates and satisfactory service from public service companies.

John H. Fletcher, chief engineer of the Kansas commission, recently recommended to that body a plan to eliminate the variations existing under the rate schedules now in effect. Holding that the rate schedules of the Kansas Gas & Electric Company, Wichita, serving 62 communities of varying size with the same rates, are "basically sound," Mr. Fletcher has asked that the commission require all other Kansas companies to conform to the Kansas Gas & Electric basis, and in order that the companies themselves may have an opportunity to adjust their rates before the commission takes final action, he has recommended a conference of all electric utility companies save the Kansas Gas & Electric Company.

Ultimate 400,000-Kw. Rating for New Paris Station

The Union d'Electricité, Paris, is planning the construction of a large steam-driven generating station at Vitry. The plans call for a power plant having an ultimate capacity of 400,000-kw., which will rank with the largest stations of its kind in the world. The Union d'Electricité, in which American capital has been invested through the International Power Securities Corporation, supplies electric service to the great industrial districts surrounding Paris on all sides within a radius of 30 miles and a large part of the power used for electric transportation within the walls of Paris.

The consumption of electrical energy, which has been increasing at the rate of 10 per cent annually in the Paris district, had grown in 1926 to 1,400,000,000 kw.-hr. A large part of this power is supplied by the Union d'Electricité. Increased demands have resulted in expansion of the great Genevilliers plant of the Union d'Electricité, and the new station at Vitry will share the load of the Paris district. The distribution system of the Union d'Electricité in the southeast suburbs is already connected with the newly installed hydro-electric plant at Eguzon, on the Crouse River, south of Paris, by a double 90,000-volt transmission line, to which there will soon be added a 150,000-volt line.

Puget Sound Power & Light Abandons Merchandising

Controversy in the Seattle City Council and municipal lighting department over the proposal to discontinue the sale of washing machines and other electrical devices by the department is still unsettled. In the meantime A. W. Leonard, president Puget Sound Power & Light Company, has announced that on Jan. 1 his company will discontinue the sale of all electric appliances, including domestic appliances and tableware, excepting only ranges, electric heaters and refrigeration equipment.

For years in Seattle dealers in appliances have brought pressure to bear to induce the Puget Sound Power & Light Company and the municipal light and power department to abandon merchandising. The privately owned company on various occasions agreed to desist provided the city would do the same. Now it has acted without waiting for the city.

Jobbers Hear Commercial Development Plans

"The electrical industry is entering a new era, an era of commercial development, with the minds of the chief executives of the power companies the country over centered on load building," said R. H. Ballard, vice-president and general manager of the Southern California Edison Company, in addressing members of the Pacific Division, Electrical Supply Jobbers' Association, at Del Monte, Cal., Oct. 22. "Central stations are not going to be satisfied with a load factor of 60 per cent when it could be made 70 or more, nor are they going to be satisfied with selling 365 kw.-hr. per year to a residential customer when the customer is willing to buy a thousand. The problems of power production, engineering and finance are now largely settled and central stations are concentrating on load building, and in this work they must have the assistance of the jobber and of every man in the industry," he declared.

A number of utility executives present added words of indorsement to what Mr. Ballard had said and pledged their support to their commercial departments and to the jobber, dealer and manufacturer. Those making short addresses included, F. A. Leach, Jr., R. E. Fisher and J. F. Pollard, Pacific Gas & Electric Company; A. G. Wishon and A. Joy, San Joaquin Light & Power Corporation; A. B. Day, Los Angeles Gas & Electric Corporation; E. B. Criddle, Southern Sierras Power Company; M. F. Wales, Coast Counties Gas & Electric Company, and W. L. Frost, Southern California Edison Company.

Briefer News

RICHMOND'S COMING "WHITE WAY."—The inauguration of a great auditorium in the new Shrine Mosque at Richmond, Va., which is expected to attract many visitors ,and conventions to the city, will probably be closely followed by white ways on Laurel and Main Streets, plans for such an illumination being now before the Common Council and likely to be made a reality by the first of January.

COAL STRIKE MAY AFFECT COLORADO UTILITY COMPANIES.—The coal strike in Colorado is said to have almost depleted the market in that state of mine-run, steam and lignite coal, leaving only a small amount of bituminous available. Power plants burning these fuels say that their reserve supply will carry them over for thirty days. After that, if the strike continues, they may be forced to burn high-grade coal. The expectation, however, is that the disturbance will be short-lived.

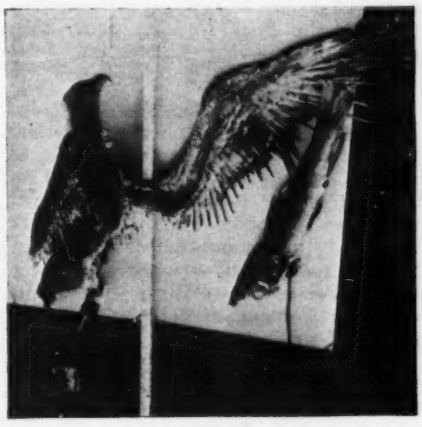
TEXAS POWER & LIGHT'S NEW TRANSMISSION LINES.—The promised extensions of the east Texas transmission system of the Texas Power & Light Company are under way. Approximately 113 miles of wooden-pole construction will be added to the system supplied with power by the company's Trinidad plant, which, designed for an ultimate capacity of 162,000 kw., now supplies 40,000 kw. from two steam turbine units. The extension will serve Nacogdoches, Lufkin, Cushing and the oil and ore fields near Jacksonville and Frankston.

IDAHO POWER COMPANY DEDICATES PARK IN MEMORY OF W. H. TRENNER.—Trenner Memorial Park, situated upon an island in Snake River, below the American Falls dam, has been dedicated by the Idaho Power Company to the memory of the late William H. Trenner, former chief engineer of the company. A huge shaft of lava rock from the Craters of the Moon, with a bronze bas relief of Mr. Trenner, was unveiled. The dedicatory address was given by H. L. Sanger, chief engineer of the power company.

GATINEAU POWER COMPANY'S OPERATING PLANS.—The Gatineau Power Company has decided to operate only three 34,000-hp. units at each of its plants at Chelsea and Farmers Rapids, on the Ottawa River, this year, despite the fact that both these plants were planned for an initial installation of four units. The amount of electricity generated with the six units will be sufficient during the remainder of the year. Work is, none the less, going on in connection with the third development at Paugan Falls, further up the river, and it is expected that this latter plant will be ready to operate by the fall of 1928. The company is also applying for authority to construct dams, a power house and other necessary works on its site at Ripon, Quebec. The works are to be built in and along the North Nation River.

BRAWLEY, CAL., IS CONTEMPLATING STEAM PLANT.—The City Council of Brawley, Cal., has passed a resolution authorizing the city engineer to investigate the costs and possible revenues from a city-owned steam generating plant. It was the consensus of opinion at the Council meeting that electricity could be generated at less than 1 cent per kilowatt-hour in such a plant. Brawley, a city of 6,000 population in the northern end of the Imperial Valley, is now served by the Southern Sierras Power Company.

"THE TWO SUCKERS; OR, A POOR FISH AVENGED."—Cross-arms on poles of transmission lines are not proper breakfast rooms, even for a fish hawk,



and the one shown, which soared aloft with his prey on a recent morning, came to an untimely end. The hawk, measuring five feet with his wings outstretched, settled on the cross-arm of a pole on the transmission line of the Northern Pennsylvania Power Company near Athens, N. Y. The bird folded his wings, one of them touching a wire. Line patrolmen, searching for the cause of a series of momentary interruptions, discovered the hawk and a sucker, 15 inches long, on the cross-arm and removed them with switch-sticks. They were equally dead.

PURDUE HOLDS AGRICULTURAL ELECTRICAL SHORT COURSE.—Approximately one hundred rural service men from the Middle West registered recently at Purdue University, Lafayette, Ind., for what is thought to have been the first agricultural electrical short course ever held. It was under the auspices of the Purdue agricultural experiment station in co-operation with the Indiana Electric Light Association and lasted four days. The attendants were told of progress made and expected, and utility company representatives pledged co-operation. Dr. G. I. Christie emphasized the importance of proper equipment.

FUTURE GENERATING PROJECTS OF SOUTHERN POWER COMPANY.—The Duke interests, controlling the Southern Power Company and Southern Public Utilities Company, are understood to be finishing or contemplating expenditures of many millions, which, however, include university and railroad extensions. Electrical items are a coming hydro plant at a location not disclosed, to cost $6,000,000; three smaller steam power plants, to cost in the aggregate about $2,000,000, and a large number of miscellaneous construction and extension projects.

THREE SUBSIDIARIES OF GENERAL GAS & ELECTRIC CORPORATION ARE EXPANDING.—The Binghamton (N. Y.) Light, Heat & Power Company, subsidiary of the General Gas & Electric Corporation, has just completed a 30,000-kw. unit at its Johnson City station, thereby more than doubling generating capacity at that point, the parent company reports. The Holland steam generating station of the New Jersey Power & Light Company has been started, and the 12,500-kw. steam plant of the Florida Public Service Company will be ready for operation during 1928.

FREE ENGINEERING FILMS AVAILABLE.—Stone & Webster, Boston, are accepting bookings for the free use of two two-reel motion-picture films prepared for popular and technical exhibition. The first, entitled "From Coal to Electricity," depicts the detailed process of electrical energy production in the modern power station. The second, which will be released about Nov. 15, features the construction of the 600,000-hp. hydro-electric development of the Philadelphia Electric Company near Conowingo, Md.

MERIDEN, CONN., TO GET ENERGY FROM DEVON HYDRO PLANT.—The Connecticut Light & Power Company has announced the purchase of a 65-ft. right-of-way between its hydro-electric plant at Devon and Meriden, Conn., distant 30 miles. The company is to begin work at once to clear the property and will erect steel towers for a high-tension transmission line. A new unit in the Devon plant will be used to supply energy to the New York, New Haven & Hartford Railroad and the street-railway system of the Connecticut Company.

LOS ANGELES POWER BUREAU'S NEW SUBSTATIONS.—Two new substations with a total capacity of 300,000 hp. were placed in operation on Oct. 13 by the Bureau of Power and Light of Los Angeles. One of these is at Ninety-fifth Street and Central Avenue, and the other is in Wilmington. It is planned, according to E. F. Scattergood, chief electrical engineer for the bureau, to construct eventually a 60,000-volt belt line completely surrounding Los Angeles. These two substations form the first units in the pro-

posed system. The new Central Avenue station, known at Station B, cost in excess of $1,500,000, while Station C, at Wilmington, cost $750,000.

GROWTH OF ELECTRIC SERVICE IN NORTH DAKOTA.—According to Frank Milhollan, chairman of the North Dakota Board of Railroad Commissioners, a million dollars is being spent in the development of electric transmission lines in North Dakota this year and another million in generating plants and equipment. Electric transmission lines in the state have, he says, grown from a total of 7 miles in 1911 to 1,975 miles, representing an investment of $3,250,000. He predicts that within the next few years North Dakota will in all likelihood be served by not more than five interconnected electric companies.

ILLINOIS NORTHERN UTILITIES COMPANY ACTIVITIES.—The Illinois Northern Utilities Company is constructing a 33,000-volt substation at Sterling, Ill., which will be connected with a 33,000-volt line from its hydro-electric generating stations at Dixon and Sterling to assure an uninterrupted supply of power. The company is rebuilding its power lines at Harvard and work has just started on the reconstruction of part of its lines at Marengo. The company also reports that 70 per cent of the right-of-way for the 132,000-volt transmission line from Dixon to Belvidere has been acquired. This line will be operated in the first instance at 66,000 volts but will be built for subsequent increase to 132,000.

LARGE HYDRO PLANT ON LAKE KEUKA, N. Y., ENVISAGED.—Work on the Lake Lamoka Power Company's temporary dam at Bradford, N. Y., the preliminary to a large power undertaking based on making an artificial reservoir in the Lamoka Valley, in upper New York State, and changing the course of the watershed near the proposed power plant on the edge of Lake Keuka, has begun. A permanent dam will eventually, if the plans are carried through, be constructed 4½ miles below the site, and this project probably would be supplemented by minor ones along the lower reaches of Mud Creek. The reservoir will be 14 miles long and will cover approximately 4,000 acres.

MORE RATE REDUCTIONS BY OKLAHOMA GAS & ELECTRIC.—A reduction and revision of electric power rates to two important classes of power customers in cities served by the Oklahoma Gas & Electric Company has been announced by Vice-President J. F. Owens. More than one hundred cities and towns are affected. The reductions apply to power customers who use the smallest amount of power and to large industrial customers whose operations permit them to make a contract with 50-kw. demand and a high load factor. In the first step of the general power rate a reduction of 12 per cent is made with an adjustment of other steps in the rate. This action follows several other voluntary rate reductions made by the company in the past two years.

KENTUCKY UTILITIES COMPANY'S NEW HIGH-VOLTAGE LINES NEARLY READY.—The 66,000-volt line of the Kentucky Utilities Company connecting Barlow and Paducah is completed and should be in regular service before Nov. 15, the engineering department reports. Satisfactory progress is reported on the 66,000-volt line, 38 miles long, between Morganfield and Earlington. Three transformers are being installed at the Morganfield substation and a large extension is being made to the Earlington substation. The engineers predict further that the middle of November will see regular operation of the additional 66,000-volt circuit being installed on the 18-mile steel-tower line between the Pocket (Va.) generating station and Imboden, Va.

FIRST ARC-WELDED BRIDGE TO BE BUILT.—An arc-welded, rivetless steel railroad bridge, said to be the first of its kind to be built, is to be erected on the line of the Boston & Maine Railroad at Chicopee Falls, Mass., according to an announcement by Gilbert D. Fish, consulting structural engineer for the Westinghouse Electric & Manufacturing Company. Completion is expected about Jan. 1. "The bridge," said Mr. Fish, "will be virtually a one-piece structure since every joint will be welded solid and immovable. Only 80 tons of steel are needed for the welded job, whereas 120 tons would be necessary if the job were riveted." The bridge, which is to be 175 ft. long, will span a water-power canal at Chicopee Falls and will connect the local Westinghouse plant with the Boston & Maine Railroad, thus eliminating trucking.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see the ELECTRICAL WORLD for July 2, page 50.]

National Electrical Credit Association—Philadelphia Division, Nov. 11; Central Division, Milwaukee, Nov. 17 and 18; New York Division, Dec. 13. F. P. Vose, 1003 Marquette Bldg., Chicago.

Electrical Supply Jobbers' Association—Book-Cadillac Hotel, Detroit, Nov. 14-18. F. Overbagh, 411 S. Clinton St., Chicago.

Wisconsin Utilities Association—Commercial Section, Hotel Pfister, Milwaukee, Nov. 17-18. J. N. Cadby, 432 Broadway, Milwaukee.

National Electrical Manufacturers' Association — Radio Division, Edgewater Beach Hotel, Chicago, Nov. 28-Dec. 1. S. N. Clarkson, 420 Lexington Ave., New York.

American Physical Society—Chicago, Nov. 25-26; Nashville, Dec. 28-30. H. W. Webb, Columbia University, New York.

American Institute of Electrical Engineers — Regional meeting Great Lakes District, Drake Hotel, Chicago, Nov. 28-30. F. L. Hutchinson, 33 West 39th St., New York.

National Association of Utility Secretaries—Oklahoma City, Dec. 5-7. E. F. McKay, 307 Local Bldg., Oklahoma City.

American Society of Mechanical Engineers—New York, Dec. 5-8. C. W. Rice, 29 West 39th St., New York.

OHIO POWER COMPANY'S SUBSTATION AT CANTON REBUILT.—The Sunnyside substation of the Ohio Power Company at Canton, Ohio, ranking with the largest in the country and connecting the company's transmission lines with those of the Northern Ohio Power Company, the West Penn Power Company and the Ohio Public Service Company, has been rebuilt. Twenty-two new circuit breakers have been installed as well as an entire new 22,000-volt switching bay, supplanting equipment installed in 1917 and no longer adequate to a system with a total rating of more than 800,000 kw. The longest interruption of service on any line during reconstruction was fifteen minutes, when temporary equipment was cut in.

NEW YORK EDISON TO LIGHT NEW YORK CENTRAL RAILROAD BUILDINGS.—The New York Edison Company has signed a contract with the New York Central Railroad by the terms of which the former company will supply all light and power for the Grand Central Terminal Building in New York City and about twenty-five other large buildings in the vicinity, all of which had formerly been supplied from the New York Central's own generating stations at Port Morris and Yonkers, N. Y. This agreement represents a total installation of about 30,000 kw. and a yearly consumption of more than 50,000,000 kw.-hr. It brings into line the largest group of buildings on Manhattan Island not hitherto served by the Edison-United system.

AMERICAN RIVER PROJECT BEFORE CALIFORNIA OFFICIALS.—Negotiations for the construction of a power and irrigation dam on the American River above Folsom Prison under the terms of an act of the last Legislature have begun at Sacramento, Cal., by a preliminary conference between representatives of the American River Hydro-Electric Company and state officials. The project calls for expenditure of $6,000,000. Under the act power is granted the State Department of Finance to lease the state-owned Folsom dam site to private interests for 50 years if provision is made for guaranteeing flood control, to aid in curbing salinity and to supply water for irrigation.

PETITCODIAC TIDAL PLANT URGED AS MEANS TO RAILROAD ELECTRIFICATION.—A few months ago, when announcement was made as to possible hydro-electric developments on the Petitcodiac River in eastern New Brunswick by

utilizing the great rise and fall of the tides of the Bay of Fundy, one of the objects suggested was the electrification of the Atlantic division of the Canadian National Railways. Matthew Lodge, a director of that railroad, said in a recent interview that it is likely a staff of government engineers will visit the scene of the proposed development to make a complete survey of both the Petitcodiac and the Mamramcook River. Mr. Lodge is said to have expressed undoubted faith in the proposed development, although he said it might be another year before anything definite could be done. The Petitcodiac Hydro Development Company is the organization behind the movement.

IMMEDIATE EXPENDITURE OF $3,000,000 ON EXISTING SKAGIT RIVER PLANT CALLED FOR.—The predicted plans for an almost immediate additional expenditure of probably $3,000,000 for developing the municipal power plant on the Skagit River are being made by the Seattle City Council. An ordinance is being prepared to authorize the building of a dam to raise the head of water at the present power house between Gorge and Newhalem Creeks and extend the two-mile tunnel which serves the plant. This proposed dam is not to be confused with the dam being constructed in Diablo Canyon at a cost of $3,500,000, which is designed to create a storage basin. The second dam is required to bring the plant to its maximum capacity and to make profitable the installation of a third generator. It will cost approximately $2,000,000 and will be built at Hanging Creek.

Recent Court Decisions

EMINENT-DOMAIN DOCTRINE APPLIES EVEN THOUGH PLANT SERVED BY CONDEMNATION OF LAND IS ACROSS STATE BORDER.—In Colgate vs. Philadelphia Electric Company, the plaintiff brought action to enjoin the defendant from condemning property in Pennsylvania for the overflow purposes of the Conowingo Dam in Maryland, which is to supply power to a generating plant likewise in Maryland designed to serve Pennsylvania consumers. In discussing the bill the United States District Court said: "The plaintiff's lands, as he views it, are to be taken by a Pennsylvania corporation, having the right to the exercise of the power of eminent domain for public uses here, for the benefit of a Maryland corporation serving a Maryland public. This, it is confidently asserted, cannot lawfully be done. The defendant corporation is, however, one of that class of corporations which goes by the descriptive name of a public service corporation. It is created for the purpose of the supply of light, heat and power to the public. It must have land to enable it to serve the public use. It may, therefore, have conferred upon it the power of eminent domain, as has been conferred, to be exercised under the conditions with which there has been or will be a compliance before the power can be exercised. A generating plant is required; this of like necessity calls for a dam. The available site happens to be in Maryland. A Maryland corporation was, because of this, created to do what was required to be done in Maryland; but the fact remains that the plaintiff's lands are none the less being taken for the at least avowed purpose of a public use to serve the Pennsylvania public. Such a use is necessarily, in this as in all cases of the taking of private lands, a prospective use. No court could restrain the taking otherwise than by a finding that the avowed public use was not a public use. This finding we could not now make. The ultimate right to lands in Pennsylvania is in the commonwealth. It may resume its possessions and control of them when the lands are required for public use. The constitution of the state recognizes this reserved power to take. The people have voluntarily imposed upon themselves a condition, without compliance with which the power cannot be exercised. This condition is imposed by that provision of the constitution which is to the effect that private property cannot be taken for public use without just compensation, paid or secured to be paid. There is no other condition than that of compensation, and no averment in this bill of a failure to comply with this. In theory, as well as in very practical effect, no property owner is deprived of his ownership by a taking by a corporation through the exercise of the power of eminent domain. The title acquired by the taker is a base fee. The possession is for the public use, and for that alone. If the use ends, or for any reason the land is not so used, the title reverts to the former owner. If there is any attempt to make other than the public use for which taken, or to divert the property to a private or other use, the owner may recover possession by an appropriate action in ejectment. It is thus clear that the plaintiff suffers no legal injury, nor any irreparable damage, by the exercise of the power of eminent domain for an avowed public use." (20 Fed. [2d] 263.)*

WHAT IS IMPLIED IN A CONTRACT GRANTING EASEMENT.—The Supreme Court of Appeals of Virginia has held, in Cantrell vs. Appalachian Power Company, that a contract granting an easement for the construction of electric lines gives all the rights necessary for the enjoyment of such easement without further consideration and takes care of any depreciation in land value, notwithstanding a provision that the consideration paid should not include damages resulting from construction. The latter provision does not, the court said, entitle the grantor to damages such as would be paid in condemnation proceedings. (139 S.E. 247.)

APPROPRIATION OF FUNDS AND LETTING OF BIDS AS COMPULSORY ELEMENTS IN BUILDING CITY PLANT.—The City Council of Sutton, Neb., has been temporarily enjoined, in an action brought by former Mayor Oschner in the District Court, from letting a contract to rebuild the municipal lighting plant, on the ground that no appropriation or levy covering the estimated cost has been made. At a former letting the Fairbanks-Morse company secured the contract on an agreement by which the cost would be repaid out of profits, but the Supreme Court set it aside on the ground that no formal letting of bids had been made by the city.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

COMMUNITY BACKING FOR SMALL ELECTRIC UTILITIES RECOMMENDED.—A solution of the problems of small electric utilities operating without profit and without prospect of profit was sought by the North Dakota Board of Railroad Commissioners recently when the Center Electric Company applied for permission to discontinue service. President Milhollan of the commission, as quoted by *Public Utilities Reports*, said that the problem of providing electric service for small isolated communities had been a perplexing one and that the commissions found it difficult to establish rates which would provide for operating expenses, depreciation and a small return upon the investment and still be within the reach of the consumer. The construction of electric transmission lines on a large scale during the past few years was said to have materially improved the situation, but it was found that the expense of constructing a line for the Center Electric Company's customers would be too large. The commission decided that the company should be permitted to discontinue its operation unless citizens would join in raising new capital with which to place the plant in proper shape to operate. It appeared to the commission that in small towns a considerable distance from a railroad or electric transmission line the problem must resolve itself into a community affair and that the only practical solution would be found in interesting each consumer to become a stockholder in the company and establishing adequate rates.

SERVICE CANNOT BE DISCONTINUED BECAUSE OF PREVIOUS OWNER'S DEFAULT OF CONTRACT.—A default in the payment of a note given to the Willow River Power Company in order to secure a service connection under a contract providing that the consumer's portion of the line cost was to be paid before the materials were purchased and construction started was held by the Wisconsin Railroad Commission not to be a sufficient cause for discontinuing service to subsequent owners of the premises. The company contended that the lawful charge for connection had never been paid and that until such charge was paid it was under no obligation to render service. It argued that the note did not constitute payment since there was no express agreement to that effect at the time between the parties, and it urged that the original occupants, if still in possession, would have no right to service until full payment was made and that their successors in possession could have acquired no rights not possessed by the original holders of the property. It was ruled by the commission, however, that the company had been under no obligation to render service until the amount was paid, and for it to do so in one instance and refuse in another might well be considered discriminatory. The company had accepted the promissory note, and a subsequent default in payment, the commission held, did not relieve the company from its obligation to serve the present occupant. Even if this conclusion were not justified, the fact that the contract and the lawful rules under which it had been entered into provided for the payment of the connection charges before the rendition of service, when considered with the fact that service had in fact been rendered for a long period of time, would estop the company from claims against a new owner.

News About Men of the Industry

F. J. Howes Resigns

Franklin J. Howes, consulting engineer for the Rochester Gas & Electric Corporation, Rochester, N. Y., will resign Dec. 1 to become public utility expert for the Prudential Insurance Company of New Jersey. Mr. Howes has been connected with the Rochester company for nineteen years, at first as assistant to John C. Parker, chief engineer, and later as chief engineer. Last year he was appointed to the position he is about to relinquish. During his years in Rochester Mr. Howes was one of the chief figures behind the extensive Caneadea Creek and Mount Morris hydroelectric power developments, which will increase the company's output greatly when completed. He has been in charge of all hydraulic developments during his service with the company. Mr. Howes is a graduate of the University of Michigan.

DEWITT CLINTON, treasurer of the Worcester (Mass.) Gas Light Company, has been elected treasurer of the New England Gas & Electric Association.

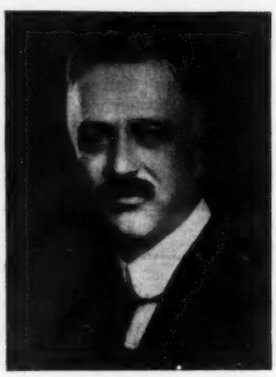
WILLIAM HENRY PATCHELL, British consulting engineer and past-president of the Institution of Mechanical Engineers of Great Britain, sailed for Europe Oct. 28 aboard the White Star liner *Olympic* after spending ten weeks in the United States.

FREDERICK KRUG, formerly assistant to the president of the Porto Rico Railway, Light & Power Company, has been appointed general manager of that utility. Mr. Krug has been affiliated with the Porto Rican properties since 1922 and has served as superintendent of the La Plaza hydro-electric plant, superintendent of power production and as assistant to the president.

WILLIAM LIONEL HICHENS has been appointed chairman of the English Electric Company, Ltd., to succeed P. J. Pybus. The appointment of Mr. Hichens brings one of the most interesting and progressive English business men to the helm of one of the largest electrical manufacturing undertakings in Europe. Since 1910 he has been chairman of the engineering firm of Cammell, Laird & Company, Ltd., of Sheffield, Birkenhead and Nottingham, which also controls the Midland Railway Carriage & Wagon Company, Ltd., of Birmingham. Other large industrial undertakings over which Mr. Hichens presides as chairman include the Leeds Forge Company, Ltd., the Newlay Wheel Company, Ltd., and the Tranmere Bay Development Company, Ltd. In addition, he is a director of the London, Midland & Scottish Railway, the Dundalk, Newry & Greenore Railway and the Power & Traction Finance Company, Ltd. Mr. Hichens has at all times been greatly interested in labor problems and is the author of a number of treatises relating to the functions of the government in relation to industry, the new spirit in industrial relations and the problems of modern industry.

H. G. Wells New President of Utilities Commissioners

Henry G. Wells, whose election as president of the National Association of Railroad and Utilities Commissioners was announced in the Oct. 22 issue of the ELECTRICAL WORLD, has been a commissioner of the Massachusetts Department of Public Utilities since 1919 and is one of the most prominent members



H. G. WELLS

of the Massachusetts bar. He was educated at Wesleyan University and the Harvard Law School, graduating from the latter in 1905. After serving in the government of his home city, Haverhill, Mass., he was a member of the Massachusetts House of Representatives from 1910 to 1912 and a state senator from 1913 to 1918, attaining the office of president in 1916 and serving in that capacity for three years. From 1918 to 1919 he was district attorney for the eastern Massachusetts district. Mr. Wells is widely known in national power-company circles, having been an N.E.L.A. convention guest speaker of interest and prominence upon the subject of regulation.

A. W. MCLIMONT, president and general manager of the Winnipeg Electric Company, Winnipeg, Manitoba, was the guest of honor at a dinner given Oct. 1 by the supervisory employees of the company to commemorate his ten-year service record with the Winnipeg company as general manager. During the dinner, which was held in the Royal Alexandra Hotel, the addresses made sketched the history of the company over the past ten years, outlining its progress under the capable management of Mr. McLimont. Later a silver loving cup was presented to Mr. McLimont as an expression of esteem by the members of his organization.

DR. FELIX DEUTSCH, head of the Allgemeine Elektrizitäts - Gesellschaft and a Privy Counselor of Defense for Germany, sailed for home Nov. 2 aboard the Cunard liner *Berengaria*, following a short sojourn in the United States. Just before sailing Dr. Deutsch visited the offices of the McGraw-Hill Publishing Company, New York.

IVAN BOWEN has resigned as a member of the Minnesota Railroad and Warehouse Commission, effective Jan. 1, to re-enter the legal profession at Minneapolis. Mr. Bowen was appointed to the board in 1921 and was later elected to a six-year term beginning Jan. 1, 1923. CHRISTIAN J. LAURISH of Mankato has been named to succeed Mr. Bowen.

C. H. HARDESTY, who has been manager of the Parkersburg and Marietta divisions of the Monongahela-West Penn Public Service Company in West Virginia, has been appointed assistant to the president of the company under a new plan of organization announced by President G. M. Alexander. W. M. MARTIN, who has been superintendent of the power department at Fairmont, has been selected to succeed Mr. Hardesty.

WILLIAM G. HOUSKEEPER has resigned from the technical staff of the Bell Telephone Laboratories, Inc., New York. During his engineering career Mr. Houskeeper has devoted his attention especially to electrical and mechanical research. He invented and developed the method of manufacturing squirted-tungsten filaments in long lengths previous to the invention of ductile filament. Two years ago he received the John Scott medal for his work in sealing copper directly to glass, a method now used in the construction of high-power vacuum tubes for radio transmission. Mr. Houskeeper is a fellow of the American Institute of Electrical Engineers and a member of the American Society of Mechanical Engineers.

JOHN L. HALEY, a vice-president of the New York Power & Light Corporation, has been placed in direct charge of the "Capitol" division, the first operating division organized by the new corporation. The division includes Albany, Troy, Cohoes, Waterford, Watervliet, Rensselaer and Hudson. Mr. Haley was for many years associated with Henry L. Doherty & Company, having received assignments to various subsidiaries of that organization. In 1922 he affiliated himself with the Adirondack Power & Light Corporation in the capacity of commercial manager, three

years later having been elected a vice-president. He has also been a vice-president of the Municipal Gas Company and of the Troy Gas Company and at the present time holds that office in the Eastern New York Utilities Corporation.

EDWIN W. VENNARD, who had been general power engineer for the Southwestern Gas & Electric Company, Shreveport, La., since February, has been appointed general commercial manager of that company. Previously he was associated with the Gulf States Utilities Company. Mr. Vennard is a graduate of Tulane University at New Orleans in mechanical and electrical engineering. Following graduation he spent one and a half years in the testing department of the General Electric Company at Schenectady.

JOHN M. HOWARD, formerly of the sales engineering staff of the National Electric Lamp Works of the General Electric Company, with headquarters at Boston, has been appointed illuminating engineer of the Central Maine Power Company, with headquarters at Augusta, Me.

R. Z. KIRK, who was manager of the Ohio Electric Power Company at Ravenna before be left the employ of that company about two years ago, has returned to his former post. Mr. Kirk is succeeding RALPH THOMAS, who has severed his connection with the company.

M. C. BARR has been appointed superintendent of Division C of the Vincennes district of the Interstate Public Service Company, with headquarters at Bloomfield, Ind., to succeed J. A. Batcheldor, resigned. Mr. Barr was formerly superintendent of the stores and purchasing department of the Vincennes district at the district headquarters in Vincennes. He will be succeded in this position by ROY C. SIBERT.

H. W. BROOKS has resigned as consulting engineer for the Erie City Iron Works, Erie, Pa., to re-engage in private consulting practice with offices in New York and St. Louis. Mr. Brooks is internationally known for his research and development work in steam power-plant engineering. He was formerly fuel engineer for the United States Bureau of Mines and during the war chief of the machinery section, Bureau of Ordnance, United States Navy. He has served in both executive and advisory capacities in the design and construction of some of the largest power plants in North and South America. He is a member of the American Institute of Electrical Engineers and the American committee of the World Power Conference, and has been a frequent contributor to the technical press.

W. B. FLYNN, formerly electrical engineer of the Georgia Power Company, has joined Stevens & Wood, Inc., as electrical engineer. From 1899, the date of his graduation from the Massachusetts Institute of Technology, to 1911 Mr. Flynn was with L. B. Stillwell engaged in railway electrification work connected with the Interborough Rapid Transit Company, the Hudson Tunnels and the New York, Westchester & Boston Railway. In 1911 he affiliated himself with Westinghouse, Church, Kerr & Company and for eight years specialized in railway and transmission developments. In 1919 he became electrical engineer of Day & Zimmermann, Inc., which position he held until 1924, when he joined the Georgia Power Company. During the first year with this company he organized the construction department, later being made electrical engineer in charge of the electrical department.

G. N. Brown Joins Ohio Brass Company

George N. Brown, formerly vice-president and sales manager of the Pittsburgh Transformer Company, has joined the Ohio Brass Company as manager of high-tension sales. Mr. Brown

G. N. BROWN

was graduated from Cornell in electrical engineering and until the World War was with the New York State Railways. He served overseas in the army and upon his return to civil life started in the selling end of the industry with the Pittsburgh Transformer Company in the New York office. Later he was made manager there. Subsequently he was made vice-president and sales manager, and he was serving in that capacity when he left to form his present association with the Ohio Brass Company.

WILLIAM J. NORTON, engineer, has organized a company to specialize in utility and industrial financing under the firm name of Norton & Company, with offices in New York. Not many years ago Mr. Norton served as first assistant secretary of the Public Service Commission of New York, First District, and later became rate engineer of the Commonwealth Edison Company, Chicago. More recently he has been a member of the engineering firm of Norton, Bird & Whiteman. Mr. Norton is a fellow of the American Institute of Electrical Engineers and a member of the American Gas Association and of the Engineers' Club of New York.

G. P. Rogers Managing Director of Supply Jobbers

Granville P. Rogers, who has been engaged in directing the work of the Artistic Lighting Equipment Association for the past two years, has been appointed managing director of the National Electrical Supply Jobbers' Association. For the present Mr. Rogers will continue his work for the lighting fixture industry as managing director of the first-named body.

A. R. TREMAINE, formerly president of the Depew & Lancaster Light, Power & Conduit Company, Lancaster, N. Y., has been appointed head of the central, western and northern New York State group of properties of the Associated Gas & Electric System. Entering the employ of the Depew & Lancaster company as superintendent in 1908, Mr. Tremaine was soon promoted to the position of general manager. In February, 1926, upon the resignation of Ernest Feyler, founder of the original Lancaster company, he, then vice-president, became president and general manager of the company.

Obituary

HENRY A. NETTLETON, superintendent of the Manchester division of the Connecticut Company, died at the Manchester Memorial Hospital, Oct. 29, following several weeks' illness. Mr. Nettleton was a native of Manchester and entered the electrical industry in 1893 as an employee of the Warring Electric Company.

R. DYER THOMAS, manager of the Denver branch of the Electric Products Company, Los Angeles, died suddenly Oct. 20 as the result of injuries sustained in an automobile accident. Mr. Thomas was returning to Denver from the convention of the Rocky Mountain Division of the National Electric Light Association at Colorado Springs. He was 35 years of age.

W. MARSHALL PAGE, vice-president in charge of sales of the Copperweld Steel Company, Rankin, Pa., and well known to public utility engineers, died suddenly Oct. 25 at Pittsburgh. For the past nine years Mr. Page had been connected with the Copperweld Steel Company, and at the time of his death he had been vice-president of the company for two years. He was also sales manager and a member of the board of directors. Mr. Page was a graduate of Columbia University. During the World War he was a member of the Engineers' Corps and the Chemical Warfare Division, and he was retired from service at the close of the war as a major and with a distinguished service award. His connection with the Copperweld Steel Company followed.

Financial and Statistical News

Utilities Hold Ground High Levels for Year Preferred Issues Active

PUBLIC utility stocks have been providing most of the pluses in market quotations during the past three weeks as general averages have been receding. Security dealers state that buying in these issues bears more or less of an inverse ratio to the market trend. As bull influences withdraw their support from the market or change over to a selling policy, commitments in such of the more stable issues as power and light stocks increase.

This year to date the trend of these stocks has been almost steadily upward. The gain so far is considerably greater than during the entire calendar year 1926. What the final two months of the year will do to this gain and to the trend is conjecture, as is any other market problem, but there appears to be less expectation of lower levels among the utilities than elsewhere, although averages in most other groups have already receded several points.

Power and light preferred stocks have been active during the week and prices have withstood the general selling movement.

August Output of Energy in Canada Rises

The output of central electric stations in Canada during August, according to the Dominion Bureau of Statistics, was 1,030,900,000 kw.-hr., as compared with 945,611,000 kw.-hr. in the preceding month and 907,050,000 kw.-hr. in August last year. Comparison with August, 1925, is even more striking, the difference amounting to 254,701,000 kw.-hr. Of the total production in August this year, 1,015,435,000 kw.-hr. was accounted for by water power and the rest by fuel-using stations.

The two central provinces, Quebec and Ontario, continue to make the most substantial gains. Ontario stations in August produced 490,758,000 kw.-hr. This is the third largest output ever recorded for any one month. At the same time Quebec accounted for a production of 357,634,000 kw.-hr., which also is the third largest monthly output for that province. Both the prairie provinces—Manitoba, Saskatchewan and Alberta—and British Columbia reported increased production during the month, the latter totaling 83,027,000 kw.-hr. and the former 71,902,000 kw.-hr. While the prairie output has been exceeded several times, it is significant that the Pacific Coast province sets a new high record. The maritime provinces—Nova Scotia, New Brunswick and Prince Edward Island—reported an increase during August of more than 40 per cent in excess of the previous month, thus bringing the total up to the level which had been prevailing during the first five months of the current year. It is noticeable that output of power in the Atlantic provinces varies more widely from month to month than in the other economic areas, but this year, with the exception of June and July, monthly production has been maintained at a comparatively high level.

Penn Central Sells Bonds to Reduce Interest Charges

Another large piece of financing on a 4½ per cent basis has just been announced by Penn Central Light & Power Company, an Insull property. As might be assumed, the purpose is to retire higher-priced bond issues and thus reduce fixed charges. The change effects a material reduction in this respect.

The purpose of this $24,000,000 issue of 50-year first mortgage bonds, specifically stated, is "to provide part of the funds necessary to retire all bonds at present outstanding against the property of the company bearing interest rates higher than that of this series of first mortgage gold bonds." The corporate set-up at present shows eleven bond issues, including five 5's, two 5½'s and four 6's. The total annual interest is in excess of $1,270,000 on $22,511,300 of outstanding bonds, while the interest charges on the new issue amount to only $1,080,000 on a larger principal amount, a saving of around $200,000 annually, disregarding the additional money secured. It is stated that net earnings for the year ended Sept. 30 have been sufficient to earn interest charges 2.62 times on the total funded debt to be outstanding after this issue is sold.

Penn Central Light & Power has shown a steady and rapid growth. Gross earnings have doubled since 1922, and the operating ratio has been steadily reduced from 57 in 1922 to 45 at present.

German Utilities Need Our Capital

GERMAN public utilities, especially power and light companies, provide a constantly expanding market for United States capital, according to Dr. Felix Deutsch of Berlin, head of the Allgemeine Elektrizitäts - Gesellschaft. In an interview with the ELECTRICAL WORLD this week Dr. Deutsch stated that capital is needed especially for such projects as the construction of high-voltage lines to convey power to the chief industrial areas—to link the south German water-power area with the Rhenish lignite district, for example. New high-tension lines on the order of 250 kv. are transmitting large blocks of energy over distances of from 500 km. to 1,000 km.

United States capital invested in German utilities has produced an attractive return for American investors in the past, and, according to Dr. Deutsch, is bound to continue to do so. In many instances utilities that were formerly operated under concession are now under state, city or municipal control. Few concessions are now being issued. Most of the large power companies are government-owned and the security of the government, whether it be city or state, is behind their loans. In the case of the Berlin utilities, for example, the Berliner Städtische Elektrizitätswerke and the Berliner Städtische Gaswerke were organized by the city in 1923 for the purpose of separately operating the electrical and gas works, formerly operated by the city. All of the stock of both companies is owned by the city of Berlin. Thus German utilities are operated under government auspices, but without the political influence so often found under that method.

While borrowers are encouraged to secure funds, so far as possible, from local investors, these large undertakings require foreign capital in addition on account of their magnitude.

New Issues Offered

With the purpose of simplifying its capital structure and that of its subsidiaries, the Cities Service Power & Light Company made an offering of 5½ per cent gold debentures amounting to $45,000,000, the price being 98 and interest, yielding 5.65 per cent. The debentures mature in 1952.

The Philadelphia Suburban Counties Gas & Electric Company offered an additional issue of first and refunding mortgage gold bonds, due in 1957, to the amount of $10,000,000 at 98 and interest, to yield about 4⅝ per cent.

Refunding mortgage and collateral trust sinking-fund gold bonds, series A, of the Ottawa Light, Heat & Power Company were offered during the past week to the amount of $3,225,000, the price being 99 and accrued interest, to yield over 5.05 per cent. These bonds, dated Oct. 1, 1927, mature Oct. 1, 1957.

BUFFALO, NIAGARA & EASTERN POWER RECAPITALIZES. — Stockholders of the Buffalo, Niagara & Eastern Power Corporation on Oct. 21 approved a plan (a) to increase the authorized preferred stock to 2,500,000 shares (par $25) and (b) to create an issue of 525,000 shares of class A stock.

Public Ownership of the Utilities Already Exists

Vice-President Cobb of the Commonwealth Power Corporation Discusses the Wide and Rapidly Expanding Distribution of Power and Light Shares

THAT public ownership in the utilities of this country already exists is pointed out by B. C. Cobb of Hodenpyl, Hardy & Company in a recent issue of the *Yale News*. Mr. Cobb shows that during the past ten years the number of stockholders in public utility companies alone has been increased by approximately four million individuals owning about $2,000,000,000 worth of stock. "This does not take into consideration the millions of dollars of public utility stocks and bonds owned by life insurance companies, savings banks and other guardians of the people's funds," he says. "Neither does it consider steam railroad securities or securities of oil, timber, coal and other like operating and producing companies, the securities of which are owned in the same way to the amount of billions of dollars. The value of all of the steam railroads and other public utility properties of the country is estimated today to be upward of $45,000,000,000, or about one-eighth of the total wealth of the nation. And this value is owned by the people themselves."

Discussing what has been termed the "Electric Trust," Mr. Cobb said:

"The electrical industry has grown so fast in the past ten years because of new inventions, improvements in the art and the establishment of so-called holding or investment supervising companies that, notwithstanding the boon it has been to the American people, it has aroused the cupidity of some and excited the political ambitions of others. . . . They have coined the term 'electric trust' and are desirous of investigating its doings and dealings.

"This leads me to say that there is no such thing as an 'electric trust,' and if such an investigation comes about, it can only be a fiasco, causing during its procedure much nuisance to many, political notoriety for a few, some temporary shrinkage in security values, with no resultant good in the end. We are a long-suffering people, slow to anger, but ever mindful of misleading, and if our self-appointed leaders, soothsayers, sages, trustbusters, or whatever we may see fit to term them, have their way, I suppose we must grin and bear it, biding the time when we can turn their pictures to the wall.

"The facts about the so-called 'electric trust' are that the largest group of jointly supervised or united companies controls or gathers under its wings only total gross receipts of the entire business done by the gas, power and light and electric railway companies of the country. If this constitutes a trust inimical to the common weal, then we are all wrong in our efforts to consolidate so that efficiency of operations, better service and lower rates of charge may be obtained.

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday, Nov. 1	Low 1927	High 1927
ABITIBI PWR. & PAPER, 4% com.—no par	131	83	141¼
Adirondack Pwr. & Lt.—7% pf.	112	107	113½
Adirondack Pwr. & Lt.—8% pf.	114	112	116
Ala. Pwr., $7 cum. pf.—no par	112½	107	112½
Allis-Chalmers Mfg., 7% pf.	m111¼	109	112½
Allis-Chalmers Mfg., 6% com.	110¼	88	118¾
Aluminum Co. of Amer., com.	96	67¾	105¼
Aluminum Co. of Amer., 6% of.	104½	101½	104½
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	105	86½	108
Amer. & Foreign Pwr., com.—no par	24½	18¾	30¾
Amer. Bosch Magneto, com.—no par	23¼	13	26½
Amer. Brown Boveri Elec†	8¾	5½	39½
Amer. Brown Boveri Elec., pf. $7	48	40	98
Amer. Gas & Elec., 6% pf.—no par	105	95½	105½
Amer. Gas & Elec., com.†—no par	110½	68¼	117½
Amer. Lt. & Trac., 6% pf.	112	112	120
Amer. Lt. & Trac., new com.	k177½	164¾	186
Amer. Pwr. & Lt., 6% pf.	106	97½	107
Amer. Pwr. & Lt., com.†—no par	66¾	54	73¾
Amer. Pub. Serv., 7% pf.	a 99	94	104
Amer. Pub. Serv., com.†	70	....	....
Amer. Pub. Utilities, 7% ptc. pf	a 89	73	90
Amer. Pub. Utilities, 7% pr. pf.	a 93½	92	96
Amer. Pub. Utilities, com.	k 57	65	70
Amer. States Sec., A	5	2¾	4½
Amer. States Sec., B	5	2¾	4¾
Amer. Superpwr., 6% ptc. pf.—25	k 29½	26½	29½
Amer. Superpwr., 6% 1st pf.	l 98½	....	....
Amer. Superpwr., Class A†—no par	k 38	27½	41½
Amer. Superpwr., Class B†—no par	38	28½	43
Amer. Wtr. Wks. & Elec., 6% pf.	100	90½	100
Amer. W. W. & E., com. new—no par	63½	46	72½
Anaconda Copper cap. $3	45½	41½	49½
Appalachian Electric Pwr., 7% pf.	106½	100	105
Appalachian Elec. Pwr., com.	m 78	77	83
Arizona Pwr., 7% pf.	k 85	77	88
Arizona Pwr., com.	m 20	....	....
Arkansas Pwr. & Lt. 7% pf.	106	....	....
Assoc. Gas & Elec., $3.50—50	51½	....	....
Assoc. Gas & Elec., pf.—$6—no par.	93¼	85	96
Assoc. G. & E., Class A, 10—no par.	43¾	35	43¾
BABCOCK & WILCOX, 7% com.	115	113	124
Binghamton L., H. & P., $6 pf.	98	93	102
Birmingham Elec., pf.—$7—no par.	109	105	110
Blackstone Valley G. & E., 6% pf.	107	103	105
Blackstone Valley Gas & Elec., 10% com.—50	130½	98	154¾
Blaw-Knox, com.†	k 95½	70	96¼
Brazilian Trac., Lt. & pwr., com.†	f202½	....	....
Brooklyn River Pwr., 7% pf.	103	97	104½
Brooklyn Edison, 8% com.	175	148¼	184½
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	l 26	....	....
Buffalo, Niagara & East. Pwr., com. $1—no par	l 34½	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	98	96	99½
California Ry. & Pwr., 7% pf.	135	125	150
Carolina Pwr. & Lt., pf.—$7—no par	l109½	107	109½
Central & S.W. Util., $7 pf.—no par	a 97½	92¾	99
Central & S.W. Util., pr.ln.$7 pf.—no par	a101	98½	104½
Central Ariz Lt. & Pwr., 8% pf.	k 97	95	98
Central Ark. Ry. & Lt., 7% pf.	106	100	104
Central Ill. Pub. Serv., $6 pf.	a 92½	88¼	95½
Central Ind. Pwr., 7% pf.	a 93½	85½	95
Central Pwr. & Lt., 7% pf.	101	100½	103
Central States Elec., 7% pf.	99½	92¾	101½
Central States Elec., com.†	29¾	17¾	30¼
Century Elec., 6% com.	b130	114	162
Chicago Fuse Mfg., com.—$2.50 no par	m 33½	30	35½
Cincinnati Gas & Elec., 5% com.	g 99½	96½	100
Cities Service, $6 pf.—no par	l 94	87	94
Cities Service, pf. B—no par	l 8¼	8	8¼
Cities Service, pf. BB—no par	l 86	80½	86
Cities Service, com.—20	l 50½	40¾	58¾
Cities Service, Bks. Shrs.—10	l 25	22½	27
Clarion River Pwr., 8% pf.	95	....	....
Cleveland Elec. Ills., 6% pf.	110½	108	112
Cleveland Elec. Ills., 10% com.	310	285	330
Columbia Gas & Elec., 6% pf.	107½	99½	108
Columbia G. & E. com. $5—no par.	88¼	82½	98½
Columbia Ry., Gas & Elec., 6% pf.	m 98	97	100
Columbus Elec. & Pwr., $2 com.—no par	67	....	....
Columbus Ry., Pwr. & Lt., 6% 1st pf.	105	98¼	106
Columbus Ry., Pwr. & Lt., 6½% pf. B	103½	96	104
Columbus Ry., P. & L., com.—no par	102	75	105
Commonwealth Edison, 8% com.	a167½	138	171
Commonwealth Pwr., 6% pf.	101½	91¼	103½
Commonw'th Pwr., $2, com.—no par	67¼	48¼	78¼
Conn. Lt. & Pwr., 8% pf.	121	119	123
Conn. Lt. & Pwr., 7% pf.	117	112	118
Cons. Gas of N. Y., pf.	99¼	93	100½
Cons. Gas of N. Y., com. $5—no par.	112½	94	121¼
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	k105	105	107
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6½% pf.	a113	110½	114¾
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	a114	112½	117
Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf.	a127½	127	130½
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $2.50—no par.	e 69	51	71
Consolidated Pwr. & Lt., 7% pf.	105	100	106
Consumers Pwr., 6% pf.	104	100	102
Consumers Pwr., 6.6% pf.	106	103	105½
Continental Gas & Elec., 8% ptc. pf.	108	103	106½
Continental Gas & Elec., 7% pr. pf.	104	100	103
Conti. G. & E. com. $4.40—no par.	k250	210	225
Crocker Wheeler, com.†	24	27	38
Crocker Wheeler, 7% pf.	80	78	88
DALLAS PWR. & LT., 7% pf.	109	107	110½
Dayton Pwr. & Lt., 6% pf.	107	101	109
Detroit Edison, 8% com.	k157½	133½	160½
Dubilier Condenser, com.—no par.	k 3¾	2¼	5¼
Duquesne Lt., 7% pf.	k116½	114½	116½
EASTERN NEW YORK UTIL., $7 pf.	107	102	104½
Eastern New York Util. com.	65	70	75
Eastern States Pwr., $7, com.	14½	11	14¾
Eastern States Pwr., pf.	95	90	95
East. Tex. Elec., 7% pf.	106	106	108
Edison Elec. of Boston, $12 com.	d247	217	267
El Paso Elec., 7% pf.	110	105	107½
Elec. Bond & Share, 6% pf.	h109	105½	110½
Elec. Bd. & Sh. Sec., com. $1—no par	l 73	67½	80¾
Electric Household Util.†	a 12½	11	15¾
Elec. Investors, 6% pf.—no par.	98½	92	97
Elec. Investors, com.†—no par.	40	32¾	42½
Elec. Investors, 10% pd. receipts.	m 15	....	....
Elec. Pwr. & Lt., ctfs. pf.	105½	96	106½
Elec. Pwr. & Lt., ctfs., 40% pd.	k118	103½	119
Elec. Pwr. & Lt., ctfs, full pd.	m114	108½	111½
Elec. Pwr. & Lt., ctfs., com.—no par.	26½	16¼	29½
Elec. Refrig. cap.†	9½	9½	37¼
Elec. Ry. Securities, com.—no par.	6	....	....
Elec. St. Battery com. $5.25—no par	71	63½	79½
Elmira Wtr., Lt. & R.R., 7% pf.	103	99	101½
Emerson Elec., pf.	m109	107½	111
Empire Pwr., ptc.†	32½	26	39
Engr. Pub. Serv., $7 pf.—no par.	m107½	93¾	108
Engr. Pub. Serv., com.—no par	38	21½	39½
Eureka Vacuum Cleaner, com. $4—no par.	73½	50	77
FAIRBANKS MORSE, 7% pf.	k109	107½	112
F.-M., com.—$3—no par.	k 34	32	43¼
Federal Lt. & Trac., com. $1.40	38½	37½	47
Federal Lt. & Trac., $6 pf.—no par.	k 98	91½	100
Ft. Worth Pwr. & Lt., 7% pf.	l111	108	112
GALVESTON-HOUSTON ELEC. 6% pf.	71	68	72
Galveston-Houston Elec., com.	32	26	32
Gen. Elec., $3 com.—no par.	125	81	146¾
Gen. Elec., special—6%	11½	11	11¾
Gen. Gas & Elec. (Del.) com. A. $1.50—no par	m 37	34	47½
Gen. G. & E. (Del.) com. B—no par.	m 45	35½	44
Gen. G. & E. (Del.) pf. A. $8—no par.	k119	113½	120
Gen. G. & E. (Del.) pf. A $7—no par.	k109	100	110¼
Gen G. & E. (Del.) pf. B $7	k102	96	105
Gen. Pub. Serv., $7 cum. pf., no par.	k109	....	....
Gen. Pub. Serv., com., no par	16	11½	18
Ga. Lt., Pwr. & Rys., 6% pf.	93	87	96
Ga. Lt., Pwr., & Rys., com.	m 50	50	80
Ga. Ry. & Pwr., 8% pf.	k125	119	125
Ga. Ry. & Pwr., 7% pf.	k113½	106	110
Gt. Western Pwr., 7% pf.	b103	....	..
IDAHO PWR., 7% pf.	106	103	109
Ill. No. Utilities, 6% pf.	k 96½	92	97
Ill. Pwr. & Lt., 7% pf.	101½	99	101½
Ingersoll Rand com. $8	k 88	87½	96½
Int. Combus. Engr., com. $2—no par	42½	40¾	64
Int. Util., Class A—$3.50—no par.	46¾	28	47½
Int. Utilities, Class B—no par.	8½	3	9½
Interstate Pwr., pf.—$7—no par.	100	98	99½
Interstate Pub. Serv., 7% pf.	100	98	99½
Iowa Ry. & Lt., 7% pf.	97	97	99
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	104½	97½	105
Johns-Manville, com.†—no par.	115¾	55¼	123½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, Oct. 29. lBid price Wednesday, Nov. 2. mLatest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday, Nov. 1	Low 1927	High 1927
KANSAS CITY PWR. & LT. pf.$7	k115¼	112	116
Kansas Gas & Elec., 7% pf.	f106	103	107
Kentucky Hydro-Elec., 7% pf.	a100½	94½	100
Kentucky Sec.,6% pf.	86	83	87
Kentucky Sec., 5% com.	109	110	115
Kentucky Utilities, 6% pf.	100	95	101
Keystone Pwr. & Lt., pf.	m98	95	100
LACLEDE GAS LT., 12% com.	k200	173¼	267½
Lehigh Pwr. Sec., com.—no par.	19½	15	21½
Long Island Ltg., 7% pf.	110½	107	112
Long Island Ltg., com.†—no par.	165	139	180
Los Angeles Gas & Elec., 6% pf.	103	98	104½
Louisville Gas & Elec., cl. A. $1.75	26¼	23¼	27½
MAN. ELEC. SUPPLY, cap. $5—no par	46½	43	132
Manila Elec., com.†—no par	k 56½	40	60
Maytag Mfg., com. .50—no par	31	23¼	34½
Memphis P. & L., pf.—$7—no par	109½	107	109
Metropolitan Ed., pf.—$6—no par.	103	93	100
Metropolitan Ed., pf.—$7—no par.	108	104	108
Metropolitan Ed., com. $5—no par.	70	60	72
Middle West Utilities, 7% pf.	a116½	110½	113½
Middle West Util., 8% pr. lien	a126	117½	124
Middle West Util., com. $6—no par	a114	108	117½
Midland Utilities, pr. in, 7% pf.	a104	97½	107½
Midland Utilities, 7% pf. A	a100½	91	92½
Milwaukee Elec. Ry. & Lt., 7% pf.	k102	100	103
Milwaukee Elec. Ry. & Lt., 6% pf.	k 98½	98	101½
Minn. Pwr. & Lt., 7% pf.	f107	104	107
Miss. Pwr. & Lt., $8 pf.	m101	106	103
Miss. River Pwr., 6% pf.	104	94	104½
Miss. River Pwr. 3% com.	62	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par	106	100	109
Mohawk Hudson Pwr., 2d pf.—$7—no par	110	98	112
Mohawk Hudson Pwr., com.—no par	29	20½	32½
Montana Pwr., 7% pf.	m106½	118½	106½
Montana Pwr., 5% com.	103½	81½	109½
Montreal Pwr., 7% com.	f 89½	....	....
Mountain States Pwr., 7% pf.	100	97	101
Mountain States pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	107	98	110
National Carbon, 8% pf.	a137	130½	139½
National Elec. Pwr., A†	a 26½	22	28½
National Lt., Ht. & Pwr., com.	24	....	....
National, Light, Ht. & Pwr., 5% pf.	70	....	....
National Pwr. & Lt., pf.—$7—no par	107	101	110
National Pwr. & Lt., com.†—no par.	22½	19½	26½
National Pub. Serv., 7% pf.	100½	93	100
National Pub. Serv., 7% pfc., pf.	114	108	115
National Pub. Serv., A com. $1.60—no par	22½	18½	24
National Pub. Serv., B com.—no par	23½	14	23½
Nebraska Pwr., 7% pf.	f110	106	110
Nevada-Calif. Elec., com.	k 26	22	27
New Brunswick Pwr., 4% pf.	60	....	....
New Eng. Pub. Serv., pr. in. pf. $7..	101	98½	102
New Eng. Pub. Serv., pf. $7.	98	95	99
New Orleans Pub. Serv.—7% pf.	103	103	105½
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	90	91	97
N. Y. Central Elec., 7% pf.	102	101	104
Newport News & Hampton Ry., Gas & Elec., 5% com.	109	....	....
Newport News & Hampton Ry., Gas & Elec., 7% pf	109	....	....
Niagara Falls Pwr., 7% pf.—25.	k 28½	27½	29½
Niagara, Lock. & Ont. Pwr., 7% pf.	114	112½	116
No. Amer., 6% pf.—50.	53½	50	55
No. Amer., com.—10	58½	45½	64½
No. Caro. Pub. Serv., pf.—$7—no par	102	93	102½
Northeastern Pwr., com.	24	14½	25
No. N. Y. Utilities, 7% pf.	106	103	109
No. Ohio Pwr., com.—no par.	16	9½	18½
No. Ohio Trac. & Lt., 6% pf.	85	78	81
No. Ont. Lt. & Pwr., 6% pf.	k 91½	84	95
No. Ont. Lt. & Pwr., 4% com.	72	73	78
No. States Pwr., (Del.) 7% pf.	107	101	109
No. States Pwr., (Del.) 8% com.	124½	....	....
No. Texas Elec., 6% pf.	k 65	65	70
No. Texas Elec., com.	k 20	27	36
OHIO BRASS, com. B $4—no par.	99	76	99½
Ohio Brass, 6% pf.	105½	100	107
Ohio Pwr., 6% pf.	103½	96	104½
Ohio Pub. Serv., $6 pf.	98½	95	96½
Ohio Pub. Serv., 7% pf.	108	104	109
Ohio River Edison, 7% pf.	108	103	109½
Oklahoma Gas & Elec., 7% pf.	103	....	....
PACIFIC GAS & ELEC., 6% pf.	26½	24½	26½
Pacific Gas & Elec., 8% new com.	41½	31	45½
Pacific Pwr. & Lt., 7% pf.	f104½	102	104½
Penn Cent. Lt. & Pwr., $5 pf.—no par	c 79½	75½	80
Penn-Ohio Edison, 7% pf.	104½	97½	109½
Penn-Ohio Elec., 7% pf.	m102	99	103
Penn-Ohio Pwr. & Lt., 7% pf.	109	99	110
Penn Pwr.& Lt.—$7—no par.	f109½	107	109
Penn Wtr. & Pwr., 8% com., new	e 69	47½	73½
Phila. Co., 6% pf.—50.	c 46½	49	54
Phila. Co., com.—50.	128	85½	132½
Phila. Elec., 8% com.—25.	c 53	46½	58½
Portland Elec. Pwr., 7% pf.	100	97½	102½
Portland Elec. Pwr., 6% pf.	80	78	84
Portland Elec. Pwr., 6% 2d pf.	65	55	70
Portland Elec. Pwr., com.	32	10	33
Potomac Elec. Pwr., 6% pf.	j111½	....	....
Pwr. Corp. of N. Y., com. $1—no par	m 79	....	....
Pwr. Sec., pf.—no par.	k 43	28	45
Pwr. Sec., com.—no par.	k 12	5	15
Public Serv. of Colorado, 7% pf.	f103	99	103
Pub. Serv. of N. J., 6% pf.	k102½	98½	102½
Pub. Serv. of N. J., 8% pf.	133½	125	133½
P. S. of N. J. $2 com.—no par.	42½	32	46½
Pub. Serv. of No. Ill., 6% pf.	a109	101½	107
Pub. Serv. of No. Ill., 7% pf.	a117	112½	117½
P. S. of No. Ill., com. $8—no par.	a158½	140½	161½
Pub. Serv. of No. Ill., $8 com.	a161	132	161½
Pub. Serv. of Okla., 7% pr. in.	101	90	103
Pub. Serv. Elec. & Gas, 6% pf.	k108½	102	108½
Puget Sound Pwr. & Lt., 7% pr. pf.	107½	105	109
Puget Sound Pwr. & Lt., $6 pf.—no par	89	....	....
Puget Sound Pwr. & Lt., com.	34	29½	36
RADIO CORP. OF AMER., $3.50 pf.—50	54½	49	54½
Radio Corp. of Amer., com.—no par.	77½	41½	77½
Republic Ry. & Lt., pf.	m120	....	....
Republic Ry. & Lt., com.	m135	112	135
Rochester Gas & Elec. 6% pf. D.	104½	101	103½
Rochester Gas & Elec., 7% pf. B.	104	105	107
Rochester Gas & Elec., 6% pf. C.	104½	101½	103½
SAFETY CABLE, com. $4.	65½	52½	74½
San Joaquin Lt. & Pwr., 7% pr. pf.	111	105	112½
St. Joseph Ry., L., H. & P., 5% pf.	72	70	73
Servel Corp.	35cts	12cts	10½
Sierra Pacific Elec., 2% com.	29½	24½	31½
Sioux City Gas & Elec., 7% pf	104½	99	105½
Southeastern Pwr. & Lt., pf.—$7 no par	f107½	....	....
Southeastern Pwr.& Lt.,ptc.pf.	i 82	....	....
Southeastern Pwr. & Lt., com.—no par	37½	29½	40
So. Calif. Edison, 8% pf.	40	36½	40
So. Calif. Edison, 7% pf.	28½	27½	28½
So. Calif. Edison, 6% pf.	k 25½	24½	27
So. Calif. Edison, 8% com.	30½	31½	41
Southern Cities Utilities, 7% pf.	k 73	67	90½
Southern Cities Utilities, com. $4.	m 32½	31	42½
Southwestern Lt. & Pwr., A $3.	63	60	65
Southwestern Lt. & Pwr., B.	63	60	65
Southwestern Lt. & Pwr., $6 pf.	86	83	91½
Southwestern Pwr. & Lt., 7% pf.	k110½	103	110½
Springfield (Mo.) Ry. & Lt., 7% pf.	k102	95	102
Standard Gas & Elec., 8% pf	64½	57½	65½
Standard Gas & Elec., 7% pr. pf.	110½	104½	113½
Standard G. & E., com. $3.50—no par	60	54	65½
Standard Pwr. & Lt., 7% pf.	101½	98½	102½
Staten Island Edison, pf.—$6—no par	101½	99	101
Superheater, $6 com.—no par.	175	....	....
Syracuse Lighting, 7% pf.	110	103	107
Syracuse Lighting, 8% pf.	117½	....	....
Syracuse Lighting, 8% com.—no par	m300	....	....
TAMPA ELEC., com. $2.	63	....	....
Tenn. Elec. Pwr., 6% pf.	100½	92	100
Tenn. Elec. Pwr., 7% pf.	108	103	109
Terre Haute, Ind. & East. Trac., 5% pf.	26	20	30
Terre Haute, Ind. & East. Trac., com	1	1	3
Tex. Pwr. & Lt., 7% pf.	f111½	106	111½
Tide Water Pwr., 8% pf.	109	105	110
Timken Roller Bear., com.—$4 no par.	113½	78	142½
Toledo Edison, 8% pf.	m114	115	118
Toledo Edison, 7% pf.	f107	102	107
Toledo Edison, 6% pf.	k 98½	95	97
Toledo Edison, 6% com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	96½	96	99
UNITED GAS & ELEC., 6% pf.	100	98	102
United Gas & Elec., com.—no par.	m 57	....	....
United Gas & Elec. (N. J.) 5% pf.	72	70	73
United Gas Impr., 8% com.—50.	c 107½	89½	118½
United Lt. & Pwr., pf.—$4—no par.	a 54	50	57
United Lt. & Pwr., pf.—$6.50—no par.	a 94	87	97½
United L. & P., com. A .48—no par.	14½	12½	15½
United L. & P., com. B .48—no par.	a 19	15	24
Utah Pwr. & Lt., 7% pf.	f108½	104	108½
Utica Gas & Elec., 7% pf.	105	105	106½
Utica Gas & Elec., 8% com.	200	....	....
Utilities Pwr. & Lt., 7% pf.	96½	93	100
Utilities Pwr. & Lt., com. A $2.	29½	27	34
Utilities Pwr. & Lt., com. B $1—no par.	21½	13½	23½
VERMONT HYDRO-ELEC., 7% pf.	99	95	100
Virginia Elec. & Pwr., 7% pf.	108	105	110
Virginian Pwr., 7% pf.	m108	....	....
Virginian Pwr., com.	75	....	....
WAGNER ELEC., 7% pf.	b 86½	68	90
Wagner Elec., com.—no par.	b 31	18½	39½
Washington Ry. & Elec., 5% com.	j386	....	....
Washington Ry.& Elec.,5% pf.	j 99½	....	....
Washington Wtr. Pwr., 8% com.	137	136	182
West Penn Elec., 7% pf.	109½	102	112½
West Penn Elec., Cl. A $7.	k105	97½	111
West Penn Pwr., 7% pf.	k115½	111	118
West Penn Pwr., 6% pf.	107½	100½	108½
West Virginia Lt., Ht. & Pwr., 7% pf.	95	94	100
West Va. Utilities, 7% pf.—50.	m 90	48	51½
Western Pwr., 7% pf.	k101	98	101½
Western States Gas & Elec., 7% pf.	k103	96	105
Western States Gas & Elec., com.	m 38	....	....
Westinghouse Elec. & Mfg., 8% com.—50.	78½	67½	89½
Weston Elec. Instrument, Cl. A $2—no par ex.div.	30½	30	34½
Weston Elec. Instrument, com.—no par.	k 12	11	18½
Wheeling Elec., 6% pf.	102	95	104
Worthington Pump, 7% pf. A.	k 40	46	61½
Worthington Pump, 6% B.	k 36	37	54½
Worthington Pump, com.	k 28	20½	46
YALE & TOWNE com. $5—25.	k 78	70½	84½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, Oct. 29. *l*Bid price Wednesday, Nov. 2. *m*Latest quotations available. †Dividend rate variable.

"So-called superpower — which is nothing more than interconnected power, the tying together of several or many transmission lines so that those that are weak may be made strong by those that have energy to spare—is one of the things which have bothered these self-appointed leaders of the people. It has bothered them so much that they have set up a great hue and cry about the people's rights and how they, the people, are being enslaved by the 'electric trust.' Some of them go so far as to say that power developed in one state should not be transmitted outside the confines of that state unless and except it be loaded down with burdensome taxes accruing to the state in which the development is made. If such a policy were followed out, each state would keep for itself all of its own particular natural resources, with the result that they would not be properly developed and consequently few would benefit. It would be just as sane and just as wise to limit the development of a steam railroad to the confines of the state in which it originally started. Can any one imagine such a foolish thing as the compelling of each passenger to change cars at each state line border and likewise the transferring of all freight from car to car at such borders? I do not think one can. And I am sure if such a condition did exist, ours would still be a backwoods country and not an enlightened and powerful nation.

INTERSTATE COMMERCE

"Others say that if power is to be transmitted across state lines, it becomes, *ipso facto*, interstate commerce and therefore is subject to the jurisdiction of the Interstate Commerce Commission. While I hold no brief against the commission, I do not think the transmission of electric power and the operation of railroads are analogous. The one is simply the transmission of a single thing (electrical energy) from one point to another, and the other the complicated operation of railroad trains carrying not only millions of passengers but also millions of tons of commodities and manufactured articles across many state-line borders. To load the commission down with the additional work of supervising the transmission of electrical energy, when it is already overburdened with many railroad problems, would be not only unfair to the commission—and with this statement I think the commissioners will agree—but also unfair to the electrical industry and the public which it serves. It would mean delay—and delay means generally lack of progress—which would be a bad thing for

all concerned and therefore detrimental to the common weal. Aside from all this, the supervision of the sale of electricity generated in one state for transmission to another can be very easily handled by the public utility commissions of the various states interested. This is what I think should and will be done."

UNION D'ELECTRICITÉ REPORTS INCREASED OUTPUT FOR SECOND QUARTER.—During the second quarter of 1927 electricity generated in the plants of the Union d'Electricité, Paris, amounted to 179,308,000 kw.-hr. This is an increase of 7,229,000 kw.-hr. over the corresponding quarter of 1926. The company's financing in the American market has been arranged through the International Power Securities Corporation. The Union d'Electricité, Paris, supplying electric service to the great industrial districts surrounding Paris, is one of the leading power companies of France.

HOLYOKE UTILITY INCREASES CAPITAL. — At the annual meeting of the Holyoke Water Power Company it was voted to increase the capital stock from $1,800,000 to $2,400,000 by allowing stockholders of record of Nov. 15 to subscribe for one share of new stock for every three shares held, at $100 a share. It was explained that the increase of capital was to provide for future enlargement. The treasurer's report shows an increase of more than $100,000 in net earnings over the preceding fiscal year. Dividends of $396,000 were paid this year, and after providing $50,000 for federal taxes and adding to the net income the increase in value of corporation stocks there is left the sum of $44,006 to be added to surplus, bringing it to $4,470,316. Property of the newly formed Holyoke Power & Electric Company in South Hadley has been transferred to the parent company under special permissive legislation by the state.

BYLLESBY MOVES BOSTON OFFICE.—H. M. Byllesby & Company announce removal of their Boston offices from 14 State Street to 1 State Street, effective immediately.

New Utility Financing in October Heavy

Offerings Made by Electric Light and Power Companies Amount to $210,000,000—Largest Total Since January

DURING the month of October the electric light and power companies of the country issued new securities to the amount of $210,555,000, the largest total thus far this year with the exception of January, when $223,859,000 was recorded. The total compares with $104,099,500 in September and $61,243,500 in October, 1926. The ten-month period closes with a total of $1,258,071,200, against $955,349,982 for the corresponding period of 1926.

Only seventeen companies participated in the new financing in October, so that the volume of the offerings rather than the number account for the large total. The largest individual offering was made by the New York Power & Light Corporation in the form of first mortgage bonds, a piece of financing involving a total of $66,000,000. Other substantial issues were offered by the Philadelphia Electric Company and the Edison Electric Illuminating Company of Boston—the former amounting to $35,000,000 and the latter amounting to $40,000,000. Though long-term financing predominated as usual, several short-term issues appeared among the new offerings. The average rate of return yielded the investor reached the 4.83 per cent mark.

Security Issues of Electric Service Companies in October

Name of Company	Amount of Issue (Par Value)	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Eastern Shore Public Service Co.	$3,300,000	20	First mortgage and first lien gold bonds, series A	To retire present funded debt, to reimburse for recent additions and betterments and for other corporate purposes	5½	100	5.50
Duquesne Light Co.	10,000,000	40	First mortgage gold bonds	To reimburse for expenditures for additions and extensions and for other corporate purposes	4½	99	4.55
Potomac Edison Co.	2,650,000	..	Cumulative preferred stock.	To partly reimburse the company for additions and improvements	6	100	6
Central Power & Light Co.	4,000,000	29	First mortgage gold bonds		5	97	5.20
Philadelphia Electric Co.	35,000,000	40	First lien and refunding mortgage gold bonds	To reimburse in part for expenditures in retiring bonds and for expenditures made for additions and improvements	4½	98½	4.58
Public Utilities Consolidated Corp. (Arizona)	1,250,000	20	First mortgage gold bonds	Acquisition of properties	6	100	6
	550,000	..	Cumulative preferred shares.	Acquisition of new properties and securities	7	100	7
Kansas City Power & Light Co.	2,090,000	..	First preferred stock, series B	To reimburse for cost of new generating units and other improvements and betterments	6	104½	5.74
New York Power & Light Corp.	66,000,000	40	First mortgage gold bonds	To retire debt of consolidating companies and to reimburse for capital expenditures	4½	96	4.72
Edison Electric Illuminating Co. of Boston	30,000,000	3	Coupon gold notes	To retire floating debt and for future extensions	4½	100	4½
	10,000,000	1	Coupon gold notes		4	99½	4½
Pennsylvania Ohio Power & Light Co.	3,465,000	..	Cumulative preferred stock.	To reimburse for expenditures on additions and improvements and to provide funds for additional improvements	6	99	6.05
W. S. Barstow & Co.	4,000,000	15	Sinking fund gold debentures	To acquire assets of W. S. Barstow & Co. (of New York) and the W. S. Barstow Management Association	6	97½	6.25
West Texas Utilities	12,500,000	30	First mortgage gold bonds, series A	To acquire additional properties, completion of extensions and improvements and other corporate purposes	5	97½	5.15
East Coast Utilities Co.	1,000,000	10	First mortgage collateral gold bonds	To reimburse for expenditures in the acquisition of new properties and improvements, to provide funds for further extensions and for other corporate purposes	5.50	97	5.90
Georgia Power Co.	18,000,000	40	First and refunding mortgage gold bonds	To reimburse for expenditures for additions and to provide funds for further additions	5	98	5.12
Nevada-California Electric Corp.	2,750,000	29	First trust mortgage gold bonds	To reimburse treasury for expenditures on additions and improvements	5	95½	5.30
Southern California Edison Co.	2,000,000	..	Cumulative preferred stock, series C		5½	24	5.73
Southern Cities Utilities Corp.	2,000,000	1	First lien collateral trust gold notes	To retire securities	5	99½	5.25
Total	$210,555,000	(par value)		Rights	$5,125,000		
Total amount actually realized	$204,753,150			Total financing for October	$209,878,150		

Business News and Market Conditions

Committee on Fractional-Horsepower Motors to Meet

A meeting of the joint committee on fractional-horsepower motors will be held at 10 o'clock a.m. on Thursday, Nov. 17, at the Hotel Cleveland, Cleveland. At this meeting an attempt will be made to secure agreement on power factor and apparent efficiency ratings for all sizes of fractional-horsepower motors.

There will be also a discussion on starting-current and locked-rotor values for fractional-horsepower motors, and it is thought that perhaps service classifications can be made for motor applications in terms of the applications or by means of hours'-use-per-year specifications. Favorable action has been had on the ¼-hp. motor specifications agreed upon at Detroit, and much work has been done by motor manufacturers to bring suggested ratings for other sizes to the Cleveland meeting.

Changes in Export Classification

Beginning with January, 1928, the Bureau of Foreign and Domestic Commerce of the Department of Commerce announces that it will make a change in its export classification covering meters. The classification now listed as 7,038, covering voltmeters, ammeters, etc., will be divided into two classes as follows: No. 7037 will cover ammeters, voltmeters and wattmeters, and No. 7038 will cover other recording, indicating and testing apparatus.

Orders for Electrical Goods

News orders booked during the third quarter of 1927, as reported to the Department of Commerce by 86 manufacturers of electrical goods, were $233,521,000, as compared with $235,725,548 for the second quarter of 1927 and $241,114,209 for the third quarter of 1926.

The accompanying table showing the bookings for each quarter since the beginning of 1922 is presented, not as a complete statement of the industry but as probably sufficiently representative to indicate the trend. Orders received during the third quarter of this year are only about 3 per cent less than for the corresponding quarter last year, while for the nine months ended Sept. 30 orders placed are not quite 5 per cent less than for the first nine months of 1926.

Australia Considers Increasing Duties

The Tariff Board of Australia is considering increases in duties on electrical appliances. This news is contained in a cable dispatch from Trade Commissioner Earl C. Squire, Sydney, to the United States Department of Commerce.

Half-Watt Lamp Patents in France

The Compagnie des Lampes of Paris recently brought an action against a number of electric lamp manufacturers in France for infringement of the Langmuir patents in respect of half-watt gas-filled lamps. The verdict of the lower courts went against the plaintiffs, who took the cases to the courts of appeal, where the verdict of the lower courts has lately been confirmed. It sustains the contention that the French patent of Alfred Henry taken out in 1900 forms a complete anticipation of Langmuir's patent. The result is of importance to French electric lamp manufacturers inasmuch as it settles the contention that no patent infringements are involved in the manufacture of half-watt gas-filled lamps in France.

Electrical Committee Membership Changes

Changes in the membership of the electrical committee of the National Fire Protection Association have recently been effected as follows:

E. D. McCarthy of McCarthy Brothers & Ford, Buffalo, has been appointed as successor to Thomas J. Creaghead, for the Electrical Supply Jobbers' Association, and W. I. Bickford of the Iron City Electric Company, Pittsburgh, has been named as alternate for the association's representatives. R. H. Manson of the Stromberg-Carlson Telephone Manufacturing Company, Rochester, and Harold L. Olesen of the Fansteel Products Company, North Chicago, Ill., have been named as representative and alternate, respectively, for the Radio Division of the National Electrical Manufacturers' Association.

John Price Jackson will continue as the representative of the American Institute of Electrical Engineers and W. T. Morrison of the New York Edison Company, New York, has been appointed as his alternate in place of Farley Osgood, the present alternate for the Institute. C. A. Bates has resigned as chairman of the special committee on the control of portable devices, but will continue as a member. R. M. Nesbitt has agreed to serve as chairman of this committee until the next annual meeting. H. R. Sargent has accepted an appointment as chairman of the committee on article 12 and replaces C. A. Bates on this committee as the representative of the supply division, N.E.M.A. Colonel E. F. Norton, New York, has been named as the representative of the N.E.M.A. in place of A. E. Waller of the technical subcommittee for section 506 (underfloor raceways).

Market Conditions

SALES of 86 electrical manufacturers for the third quarter are only about 3 per cent less than in the corresponding quarter last year, and for the nine months not quite 5 per cent less. Like last week, the Southeast and Northwest report the most active business, but the activity seems to have spread down the Pacific Coast. Sales of special equipment constitute the principal activities of New England and the Middle Atlantic States. Plans to electrify a branch of the Reading Railroad lend another optimistic note to the situation.

Perceptible increases in orders are reported from the Northwest, lumber mills, the Cedar Falls hydro extension and considerable street lighting in Seattle, Sumner and Centralia being prominent. Announcement of a new power plant by the Alabama Power Company, three orders for cable totaling $38,000, one order for distribution transformers of $13,000, three orders for poles of $13,400, and activities of textile mills constitute high spots of Southeastern business.

Interest in poles is very pronounced on the Pacific Coast, San Joaquin ordering $15,000 worth last week and a South American firm 5,000 35-ft. poles. Honolulu bought 50,000 ft. of lamp cord and 5,000 ft. of conduit. A Hawaiian sugar plantation ordered $15,000 worth of transformers. California took 25,000

ORDERS FOR ELECTRICAL GOODS

Quarter	1922	1923	1924	1925	1926	1927
First	$143,320,453	$225,399,383	$228,760,838	$233,023,182	$262,677,736	*$245,178,960
Second	165,370,750	240,542,824	221,167,876	227,502,652	248,000,075	*235,725,548
Third	167,984,466	201,910,099	185,747,314	232,933,532	241,114,209	233,521,000
Fourth	192,473,402	218,165,415	231,470,552	244,597,050	260,078,082	
Total	$669,149,071	$886,017,721	$867,146,580	$938,056,416	$1,011,870,102	

*Revised.

ft. of conduit. There were a variety of other purchases.

Around New York central-station business lags, but demands are excellent for electric refrigerators and electric insulating materials. Construction projects include cold-storage and refrigerating plants, a hydro plant, two steam plants and a paper mill. New England's purchases of spot welders and electric ranges are heavy, but sales of heavy power equipment are light. Plans are laid for a hydro plant and a fifty-thousand-dollar substation.

Strength in Copper Features Metal Market

Sales of copper have been better than was generally expected, with the result that the price is firmer than for weeks, with some sellers out of the market at their long-held quotation of 13¼ cents, delivered Connecticut. Lead demand has improved somewhat but the price is no better. Zinc has been the weak sister among the metals, last week's break below 6 cents, St. Louis, having continued, with the 5¾-cent level reached Tuesday. Metal-consuming lines continue generally active, though the current season's requirements are somewhat less than a year ago.

Most of the copper sold during the week ended Nov. 2 has been between 13.20 cents and 13.25 cents, delivered Valley, though one small lot went out as low as 13.175 cents. Nearly a week ago a good tonnage was sold in the Middle West at slightly higher prices than would be represented by the usual ⅛-cent differential, bringing the f.o.b. refinery price average up to 13.025 cents.

NEW YORK METAL MARKET PRICES

	Oct. 26, 1927 Cents per Pound	Nov. 2, 1927 Cents per Pound
Copper, electrolytic	13⅛ to 13.2	13⅛
Lead, Am. S. & R. price	6⅛	6⅛
Antimony	11	11
Nickel, ingot	35	35
Zinc spots	6.25	6.10
Tin, Straits	58⅜	56⅛
Aluminum, 99 per cent	25	25

Base copper price Nov. 2, 1927, 15⅛ cents.

A fair volume of buying at unchanged prices has characterized the lead markets during the week.

Demand for Specialties Strong in New England

In view of the slowing up of sales in this district reported quite generally by manufacturers of power equipment, the reports received of very encouraging trends in special apparatus sales are of interest. One prominent manufacturer records a strong demand for electric spot welders and one well-known plant is operating double shifts to meet the demand. Range sales are heavy. One manufacturer of combination coal and electric ranges notes a very encouraging movement in buying. Sales to date are 50 per cent above those of last year for the same period.

While a number of contracts were postponed during the past week, several small orders for substation equipment were placed. Two amounting to about $4,000 for outside control apparatus were placed in Maine. Small-motor sales slumped, scheduled materials are less active and spotty conditions prevail in power apparatus. Wiring contracts are closing up, and reflector sales are good.

The Boston Transit Commission will receive bids for a new substation until Nov. 16. Plans for large garages are reported requiring reflector lighting units. Extension of Brigham Hospital is planned for the near future.

The Western Maine Power Company, Limerick, has purchased two power sites in the Little Ossipee River Valley section for proposed hydro-electric power developments at a later date. The Edison Electric Illuminating Company, Boston, will soon begin construction of a new substation on Mystic Street, Arlington, reported to cost more than $50,000.

Large Cable Purchases in Southeast

Reasonably satisfactory orders and a good number of inquiries are reported for the Southeast this week. The Alabama Power Company has announced the proposed construction of a steam power plant in Walker County and contracts covering the installation of the first 50,000-kw. unit are expected to be placed within the next two weeks. Cable orders have led the field in the past week, some of the larger ones being for paper cable totaling $20,000, lead-covered cable amounting to $15,000 and varnished-cambric cable reaching $3,000. The total volume of transformers, meters and small motors is very satisfactory, one company alone ordering more than $13,000 worth of distribution and small power transformers last week. Line-construction materials are reasonably active, and one company ordered last week creosoted pine poles amounting to $6,400 and cross-arms and insulators totaling $2,500. Another central-station company ordered poles amounting to $5,000, while a third company's pole purchases last week totaled $2,000. A Georgia town ordered $5,000 worth of street-lighting equipment.

Two orders of $5,000 each were placed recently by two Georgia textile mills for inside construction materials going into plant additions. Two other Georgia mills have plant additions in prospect, and engineers are at present engaged in preparing plans and specifications. Each of these jobs will involve in the neighborhood of $300,000, and definite announcements regarding construction plans are expected shortly.

Among construction projects reported for the South and Southeast are: The Common Council of Yanceyville, N. C., is considering plans for construction of a transmission line from Danville, estimated to cost $25,000. The Duke Power Company, Charlotte, N. C., has preliminary plans for three steam-power plants to cost more than $1,500,000 in connection with proposed extension of the Piedmont & Northern Railway lines. Hudson & Mims, Monroeville, Ala., have authorized plans for an ice-manufacturing plant at Pensacola, Fla., estimated to cost close to $85,000. The Alabama Power Company's proposed plant in the Warrior coalfield district is expected to have an ultimate capacity of 200,000 kw., which will, with transmission lines, cost in excess of $1,000,000 with transmission lines. The City Council of Blue Mountain, Miss., is considering the installation of a municipal plant.

Numerous Pole Orders on Pacific Coast

Several large pole inquiries have featured the past week on the Pacific Coast. The San Joaquin Light & Power Corporation is asking for $15,000 worth of poles, principally 55-ft. and 60-ft. sizes. An export inquiry for South America covers 5,000 7-in., 35-ft. poles and 50,000 10-ft. roofed cross-arms. Other overseas business includes 50,000 ft. lamp cord and 5,000 ft. of 3½-in. fiber conduit for Honolulu and about $15,000 worth of transformers for a Hawaii sugar plantation, comprising 50, 150 and 37½-kva. units. A telephone company in the Santa Cruz range is asking for $3,000 worth of assorted poles. Special inquiries from San Francisco include 2,500 ft. of 1,500,000-circ.mil and 500,000-circ.mil lead-covered cable for a contractor and about $2,000 worth of miscellaneous line and wiring material for the Hetch Hetchy system. State inquiries include 25,000 ft. of ½-in. and ¾-in. galvanized conduit and $1,000 worth of dome and shallow steel reflectors for the State building at Sacramento. Machinery orders include such items as 100 washing-machine motors, valued at $2,000; also eight motors for a woodworking plant in the redwood belt, comprising 15, 30 and 25-hp. units, valued at $3,000. The outstanding order for the week was received by Westinghouse and comprised a 10,000-kva. synchronous condenser, three 6,667-kva. transformers and switching equipment valued at $125,000 for the Salinas substation.

Distinct Upward Trend in Northwest

Inquiries made during the late summer are materializing into orders and a sales volume which showed perceptible increase several weeks ago. There is a continuing upward trend with indications of exceptionally good business during the remainder of the year. Last week the following sales of consequence were reported: One 5-ton electric locomotive, two compressors with two 200-hp. motors, muckers, etc.; approximately $100,000 worth of equipment for a tunnel job in connection with Bridge River hydro-electric development for the British Columbia Electric Railway Company; a twenty-five-thousand-dollar gyratory rock crusher with one 200-hp. motor for a cement company; fifteen motors from 200 hp. down for a lumber mill at Anacortes, and about 25 motors from 50 hp. down for diversified indus-

trial purposes. It is expected that a contract will be awarded this week for furnishing 2,000 kw. in transformers and 50 motors, from 350 hp. down, for a lumber mill in Tacoma. The city of Seattle will on Dec. 2 open bids for furnishing approximately $200,000 worth of equipment for Unit No. 6 of the Cedar Falls hydro-electric development, including an alternating-current generator of approximately 14,285 kva., driven by a reaction-type turbine together with supplementary mechanical and electrical equipment. On Nov. 4 Seattle will open bids for furnishing 71,000 lb. of copper wire, and in about three weeks it will call for bids for initial contracts on the proposed million-dollar downtown street-lighting project. Sumner, Wash., has approved plans for an ornamental lighting system in the business district, and Centralia has let a twelve-thousand-dollar street-lighting contract.

Limited Orders in East, but Specialties Active

CENTRAL-STATION business in the New York territory continues to lag and actual commitments are not of appreciable account. A prominent manufacturer says that sales have been slightly lower during the past 30 days than in the month preceding, with no immediate prospects for advancement. Heavy equipment business is quiet. The call for substation apparatus is limited to smaller projects. Inquiries for transmission and distributing-line equipment are apparently for current use. It is reported that one of the large power companies operating in eastern Pennsylvania will soon make purchases for a steel-tower transmission line to extend into New Jersey, where interchange with another utility will be effected.

Excellent demand for electric refrigerators is reported by a prominent manufacturer and the outlook for continuance is encouraging. The call for vacuum cleaners shows decline. Despite reduced business in wiring supplies, indications for early revival are in sight, according to a leading producer of insulating materials. The past month has shown a gain each week in sales of compounds, varnished materials and kindred specialties, with orders in noticeably heavier volume.

Trade is fair around Philadelphia, and there is decided optimism regarding the immediate future, particularly for central-station and line equipment. The Reading Railroad is preparing final plans for electrifying its Chestnut Hill branch, with work to begin in 1928 and be carried out over a period of 24 months. It is expected to cost more than $4,000,000, including electrification of the Reading Terminal and grade crossing elimination. Other branches will be electrified later. The Westinghouse Electric & Manufacturing Company is building several turbo-generators, among which is a unit for the Anglo-Canadian Pulp & Paper Mills, Ltd., Limoulu, Que. Officials of the Pennsylvania Power & Light Company, Allentown, have organized a subsidiary to construct a transmission line in Haycock Township.

Immediate construction operations in the eastern district include the following: The Greenwich Storage Company, New York, will install an electrically operated six-story cold-storage plant. The New Kanawha Power Company, New York, has tentative plans for a hydro-electric power development on the New River near Glen Ferris, W. Va. The Lehigh Traction Company, Hazleton, Pa., contemplates the construction of a steam-operated electric generating plant. The John Lang Paper Company, Philadelphia, will electrify its proposed mill at Gloucester, N. J.

Breaker and Maintenance Purchases in Middle West

Very little change in business was noticed in the Middle West this week, but conditions point to a favorable closing of the month and better future business. Reports from agricultural districts are excellent with increased volume of business for the mail-order houses. Industrial activity is steadily improving with seasonal increases in many lines. The utility companies are busy with construction of new plants and additions to present systems. Not a little apparatus purchasing is going on, among which are the following items: water-treating plant, plumbing and ventilation valued at $500,000; transformers, switchboards and switching equipment, valued at $500,000; soot blowers for three boilers complete with appurtenances; 57 600, 1,200 and 3,000-amp., 88-kv., single-pole, single-throw, wheel-mounted oil circuit breakers and 106 600-amp., 15-kv. frame-mounted breakers. Maintenance purchases of one utility company average about $55,000 a day.

Jobbers' sales continue to increase. Appliances are moving readily, particularly toasters, waffle irons and headlight heaters. There is a good demand for washing machines and vacuum cleaners, while the sale of ventilation equipment is still good. Prices remain generally firm. Lamp cord prices advanced approximately 5 per cent, effective Oct. 27.

The volume of sales in the St. Louis district has, apparently, decreased slightly during the week. Manufacturers report a fair demand for the smaller motors and transformers of stock sizes used the most by industrial companies. Sales included cable for installation locally, $10,000; seven 1,000-kva. transformers, at a cost of about $20,000, for a distributing company in the Southwest, and electric welding equipment for a manufacturing company in the southern part of this territory, to cost $5,000. There has been a continued demand for building construction material, but slightly less than previous reports. One large manufacturer of electric appliances says sales of cooking and heating apparatus have been above normal even for this season of the year.

Construction projects reported include the following: The Lehigh Briquetting Company, Lehigh (N. D.), plans early erection of a power plant to cost $650,000. The City Council of Cedar Rapids, Iowa, has plans maturing for installation of ornamental street lighting system. The Interstate Power Company, Decorah, Iowa, plans construction of transmission lines in Dubuque and Jackson Counties. The Columbia Mills, Inc., Chicago, plan electrification of a proposed one-and-three-story shade-cloth mill at West Pullman, estimated to cost $300,000. The Illinois Northern Utilities Company, Dixon, Ill., is closing arrangements for purchase of the municipal lighting plant at Rochelle, Ill., for $200,000. The Calumet & Hecla Company, Calumet, Mich., plans construction of transmission line to its No. 5 Tamarack mining properties. The City Council of Harvard, Neb., has authorized plans for a municipal electric light and power plant. The San Antonio Public Service Company, San Antonio, Tex., plans construction of a 40,000-hp. steam generating station estimated to cost $1,250,000, with transmission system.

Activities of the Trade

Electric Trade Association Is Formed in Philadelphia

To further the interests of the electrical industry the Electric Trade Association has been formed in Philadelphia. The officers elected are: President, R. S. Brunhouse, Merchant & Evans Company; vice-president, E. L. Austin, Kelvinator, Philadelphia, Inc.; secretary and treasurer, Albert C. Little, Philadelphia Electric Company. In addition to the officers the following were elected to the board of directors: W. J. K. Hunt, Philadelphia Iroquois Company, and F. H. Ehnts, Welsbach Company. Among others present were Howard A. McKee, Copeland Products, Inc.; A. L. McMillan, Philadelphia Electric Company; H. C. Jackson, Kelvinator Philadelphia, Inc., and H. W. Walz, Masland Zerozone Company.

Foamite-Childs Combines with American-La France

Effective Nov. 15, the American-La France Fire Engine Company, Inc., Elmira, N. Y., has acquired the assets and good will of the Foamite-Childs Corporation, Utica, N. Y., and the business of the two companies will be combined under a single corporate identity. The name of the company will be the American-La France & Foamite Corporation. The combination will maintain

sales offices and engineering representatives in all the principal cities of the United States and Canada. Affiliated companies will operate in foreign countries.

Westinghouse Consolidates Merchandising Territories

J. S. Tritle, general manager of the merchandising department of the Westinghouse Electric & Manufacturing Company, announces the consolidation of several merchandising territories and the appointment of executives for these sections. M. C. Morrow has been made sales manager of the merchandising department. F. R. Kohnstamm is now assistant sales manager. T. Paul Teller has been appointed manager of the interior lighting section with offices at South Bend, Ind. The territory comprising the Northeastern sales section and the Philadelphia district will be known as the Northeastern merchandising district, and George T. Kunklin has been made district merchandising distribution manager, with headquarters in New York. The present San Francisco, Los Angeles and Seattle districts will be known as the Pacific Coast merchandising district, with George Bailey in charge in San Francisco as district merchandising distribution manager. The present Pittsburgh, Cincinnati and Detroit districts will be consolidated as the North Central merchandising district under P. Y. Danley, with headquarters at Mansfield, Ohio.

THE WESTERN ELECTRIC COMPANY reports sales billed for the nine months ended Sept. 30 as $181,050,000, compared with $181,123,000 for the same period in 1926.

THE PACKARD ELECTRIC COMPANY, Warren, Ohio, manufacturer of transformers and automotive cables, announces that C. J. Rhea has joined the Chicago branch as assistant to Howard Johnson, manager of the Chicago territory. That territory has recently been enlarged by the addition of the State of Iowa, which was covered for many years by J. K. Alline (deceased.)

FAIRBANKS, MORSE & COMPANY report for the quarter ended Sept. 30, 1927, a net income of $572,477 after depreciation and federal taxes, compared with $718,587 in the preceding quarter and $813,029 in the third quarter of 1926. The net income for the first nine months of 1927 totaled $1,391,150 after above charges against $2,446,101 during corresponding period in 1926. Orders received during the third quarter aggregated $7,844,810, while total shipments amounted to $7,951,306.

THE GRAYBAR ELECTRIC COMPANY, New York City, announces the following changes in the general sales department: E. A. Hawkins, formerly general telephone and appliance sales manager, is appointed general supply sales manager; Herbert Metz, advertising manager, is appointed general advertising and sales promotion manager; G. K. Heyer, formerly assistant general sales manager, is appointed general telephone and power apparatus sales manager; E. W. Thurston is appointed telephone sales manager, and W. H. Leathers is appointed manager of radio and government sales and will have charge of all broadcasting and signaling sales as well.

COPELAND PRODUCTS, INC., announces the appointment of Edward Barger as service manager to succeed M. B. Ellis, who has been transferred to the Chicago district. Mr. Barger has been chief inspector for Copeland for the past fourteen months.

THE RAINBOW APPLIANCE CORPORATION, Rochester, N. Y., has appointed O. J. Mitchell sales manager. Mr. Mitchell assumes the duties formerly handled by W. R. Moyes, who recently became vice-president and general manager of the firm.

THE REFRIGERATION SALES CORPORATION has been organized and established in Salt Lake City to distribute Belding-Hall electric refrigerators in Utah, Idaho, Colorado, Wyoming and Texas. The company will also open offices immediately in Denver and Dallas. The officers of the company are: T. A. Moler, president; Perry A. Clark, vice-president and secretary, and F. L. Moler, treasurer.

THE AMERICAN BROWN BOVERI ELECTRIC CORPORATION and subsidiaries report a net loss for nine months ended Sept. 30, 1927, of $151,640 after interest, depreciation, etc., compared with a profit of $1,468,898 before federal taxes in first nine months of 1926. Profit for the September quarter was $207,657 before federal taxes, against a net loss of $45,586 in the preceding quarter and a profit of $492,680 as reported by this corporation in the third quarter of the previous year.

New Equipment Available

Disconnected Ground Switch

The type "PMF" disconnecting and ground switch of the double-throw, single-break type has been placed on the market by the Delta Star Electric Company, 2400 Block, Fulton Street, Chicago. This switch is used to disconnect and ground gasoline-storage-tank sidings on railway electrifications. While the tank car is being emptied the trolley and rail are connected together to eliminate the accumulation of a static charge. The operating mechanism can be so arranged that as soon as the cars are in the siding and the handle dropped, the blade is automatically thrown into the grounded position, where it may be locked.

Totally Inclosed Motors for Portable Hoists

A new line of motors for portable electric hoists and suitable also for other applications involving intermittent operation and high starting torque has been placed on the market by the General Electric Company. The line runs from 1 hp. to 10 hp. in the direct-current types; from 1 hp. to 11 hp., single speed, three-phase and two-phase, and from 1 hp. to 5 hp., single-phase, in the alternating-current types. Three-phase and two-phase, slip-ring-type hoist motors are also included, from 3 hp. up. The new motors are totally inclosed and all parts are well protected. Bearings are of the waste-packed, sleeve type, being closed against the entrance of dirt from the outside. The direct-current motors are series-wound. The alternating-current motors of the polyphase type have high-resistance rotors, while the single-phase motors are said to have an unusually high starting torque. Since in a great many of the applications of these motors a brake is required, the motors are built with the shaft extension away from the drive to take a brake, and the motor end shield at this end is fitted with pads or bosses with drilled and tapped holes for mounting the brake.

Automatic Transfer Switch

The Sundh automatic transfer switch, designed to perform the function of automatically transferring a load from one source of supply to another, has been placed on the market by the Sundh Electric Company, Inc., Newark, N. J. This switch is intended for use with two sources of supply, a normal source and an emergency source. At all times when the normal source is alive the load is connected to that source, but should the normal source fail, the switch automatically disconnects the load and connects it to the emergency source, thus giving continuous service. Should the normal source be restored, the load is automatically disconnected from the emergency source and restored to normal. The various parts of the switch are effectively interlocked electrically and mechanically, so that the manufacturer says it is not possible to have the load connected to both sources simultaneously. These switches are arranged for use with normal and emergency sources in any of the following combinations: both sources alternating current, both sources direct current, normal source alternating current with emergency source direct current, or normal source direct current with emergency source alternating current. The switches are built for any standard commercial voltage and frequency.

Electrical Patents

Announced by U. S. Patent Office

(Issued Oct. 11, 1927)

1,645,149. DIRECT-CURRENT-GENERATOR SYSTEM; S. W. Mann, Pittsburgh, Pa. App. filed Sept. 2, 1924. Especially adapted for direct-current generators having a load or a number of loads in series.

1,645,150. APPARATUS FOR CONTROLLING THE FLOW OF CURRENT FROM DIRECT-CURRENT GENERATORS; S. W. Mann, Pittsburgh, Pa. App. filed Nov. 24, 1925.

1,645,185. HOLD-UP ALARM; G. R. Dobbins, Alhambra, Cal. App. filed May 8, 1922.

1,645,193. COMBINATION CANDLESTICK; A. H. Jones, Meriden, Conn. App. filed May 11, 1926.

1,645,201. THERMOSTATICALLY OPERATED ELECTRIC SWITCH; R. W. McBrien, Alton, Ill. App. filed July 15, 1925.

1,645,240. THREE-WAY-CAP PIN-TYPE SOCKET; W. Ile, Jackson, Mich. App. filed Aug. 18, 1925.

1,645,241. TABLE TAP; W. Ile, Jackson, Mich. App. filed May 6, 1926.

1,645,261. TERMINAL SUPPORT; E. E. Sutherland, Mansfield, Ohio. App. filed Aug. 6, 1923. For conductively attaching an electrical device such as a percolator and other heating elements to a flexible conductor.

1,645,263. TEMPERATURE-REGULATOR SYSTEM; H. R. Trotter, Morton, Pa. App. filed July 19, 1924. For controlling the exciter turbine governor in accordance with the thermal conditions in the feed-water heater.

1,645,266. INSULATOR CONNECTER; N. A. Wahlberg, Wilkinsburg, Pa. App. filed Aug. 12, 1922. For suspension insulators.

1,645,277, 1,645,278. ELECTRIC WATER HEATER; F. J. Cid, Indianapolis, Ind. Apps. filed Feb. 25 and Aug. 3, 1926.

1,645,281. CONTROL OF COMMUTATING-POLE STRENGTH ON NON-BOOSTER ROTARY CONVERTERS; F. T. Hague, Pittsburgh, Pa. App. filed Sept. 23, 1922.

1,645,286. CIRCUIT-INTERRUPTER SYSTEM; J. W. Legg, Wilkinsburg, Pa. App. filed Dec. 13, 1920. An electric circuit-interrupting valve comprising a metal casing in combination with an arch-extinguishing auxiliary circuit and means for compensating for the inductive effect of the casing when the circuit is interrupted.

1,645,287. RECTIFIER PROTECTIVE SYSTEM; D. G. Little and R. L. Davis, Wilkinsburg, Pa. App. filed April 15, 1925.

1,645,288. THROTTLING DEVICE; J. B. MacNeill, Wilkinsburg, Pa. App. filed April 13, 1922. Means for controlling the rapidly expanding gas and oil mixtures that are produced in the tanks of transformers and circuit breakers of the fluid-immersed type, through the formation of arcs, and for preventing or throttling explosive forces that are set up in the tank.

1,645,290. THERMOSTATIC SWITCH; A. J. Mottlau, Pittsburgh, Pa. App. filed April 8, 1924. Designed to respond abruptly upon the accumulation of a certain amount of energy by reason of a succession of minute temperature changes.

1,645,292. CIRCUIT INTERRUPTER; G. E. Palmer, Cambridge, Mass. App. filed March 17, 1924. For alternating-current networks.

1,645,293. ELECTRIC FURNACE RESISTER; T. A. Reid, Wilkinsburg, Pa. App. filed June 25, 1921.

1,645,296. INDUCTION MOTOR; R. Rudenberg, Charlottenburg, near Berlin, Germany. App. filed May 11, 1917. Means for producing in the rotor an effective resistance loss through leakage fields in the rotor, which loss rises as the slip increases so as to obtain the full or nearly the full torque of the motor at speeds which differ considerably from the synchronous speed.

1,645,299. ELECTRICITY METER; K. Singer, P. Paschen and G. Reime, Nuremberg, Germany. App. filed July 24, 1925. Induction type.

1,645,300. CURRENT-LIMITING DEVICE; J. Slepian, Swissvale, Pa. App. filed July 19, 1920. Electrolytic means for controlling the value of the current of an electric circuit.

1,645,327. ELECTRIC TOASTER; H. A. Hirshfeld and A. G. Stern, Philadelphia, Pa. App. filed June 15, 1926.

1,645,344. ELECTRICAL FUSE; G. C. O'Brien, St. Louis, Mo. App. filed July 3, 1925. Renewable plug or cartridge type.

1,645,346. MEANS FOR TESTING FUSES; S. Palmer, Flushing, N. Y. App. filed Aug. 3, 1926.

1,645,387. ELECTRIC SWITCH; A. M. Kinney, Norwood, Ohio. App. filed June 26, 1926. Snap-action type.

1,645,393. ELECTRIC SWITCH; A. H. Nero, New Britain, Conn. App. filed Nov. 15, 1923. Push-through type.

1,645,411. TURBINE-GENERATOR SET; E. J. Blake, Buffalo, N. Y. App. filed May 16, 1924. Adapted to be placed on locomotives.

1,645,415. MICA-PLATE COMPOSITION; J. M. Coffey, Schenectady, N. Y. App. filed April 5, 1927.

1,645,424. PROCESS OF MAKING STORAGE BATTERIES; C. W. Hazelett, Lakewood, Ohio. App. filed Feb. 21, 1921.

1,645,437. CURRENT COLLECTOR; J. Lusse and R. Lusse, Philadelphia, Pa. App. filed May 13, 1924. For electrical amusement apparatus.

1,645,447. SUSPENSION INSULATOR; J. M. Peck, Lima, N. Y. App. filed Feb. 11, 1924.

1,645,453. ELECTRICAL CONNECTION BLOCK; J. Sachs, Hartford, Conn. App. filed June 21, 1922.

1,645,474. ELECTRIC WIRE ATTACHMENT; A. E. Chapman, Wallington, England, and C. R. Cook, Boreham, England. App. filed Jan. 17, 1927. For use in or with electrical terminals, plugs, sockets, etc.

1,645,487. COMBINATION LIGHT; W. Harling, Cleveland, Ohio. App. filed April 17, 1925. Portable self-contained electric light embodying a plurality of illuminated compartments.

1,645,496. INCLOSED AND VENTILATED ELECTRIC MOTORS; C. L. Daun and P. E. Keller, Milwaukee, Wis. App filed Jan. 20, 1923.

(Issued Oct. 18, 1927)

1,645,512. GRADE-CROSSING PROTECTING SYSTEM; P. A. Bowen, Lynn, Mass. App. filed July 14, 1925.

1,645,513. INDICATOR; W. F. Dittman, Arlington, N. J. App. filed Jan. 2, 1926. Directional signals for elevators.

1,645,517. HIGH-FREQUENCY ALTERNATOR; J. Bethenod and E. Girardeau, Paris, France. App. filed Aug. 29, 1921.

1,645,526. HIGH-FREQUENCY ELECTRIC FURNACE; F. Gerth, Berlin--Tempelhof, Germany. App. filed March 24, 1926.

1,645,527. ADJUSTABLE LIGHT-HOLDING MEANS; D. D. Gordon and W. Lindsay, Chicago, Ill. App. filed June 8, 1925. For portable lamps.

1,645,528. ELECTRIC SWITCH; D. D. Gordon, Chicago, Ill. App. filed Feb. 15, 1926.

1,645,539. INSULATED CONDUCTOR TERMINAL; E. A. Mau, New Haven, Conn. App. filed July 15, 1922.

1,645,541. FUSE; E. L. Ogle, Chicago, Ill. App. filed Nov. 9, 1923. Adapted for use in multi-phase circuits. Terminal construction on the fuse body for the wires, by means of which the heating coil of the fuse is connected to another circuit.

1,645,556. SPEED GOVERNOR; G. Von Arco, Berlin, Germany. App. filed May 29, 1924.

1,645,667. ELECTRIC SADIRON; O. Spahr, Philadelphia, Pa. App. filed April 19, 1924.

1,645,698. STORAGE BATTERY; A. D. Fritman and C. Gritman, Spokane, Wash. App. filed Dec. 30, 1925.

1,645,705. ELECTRIC SPOT-WELDING APPARATUS; J. Ledwinka, Philadelphia, Pa. App. filed May 4, 1923.

1,645,710. ELECTRIC WELDING MACHINE; J. W. Meadowcroft, Philadelphia, Pa. App. filed June 20, 1922. Spot welder.

1,645,711. JIG FOR ELECTRIC WELDING SHEET-METAL PANELS; J. W. Meadowcroft, Philadelphia, Pa. App. filed April 2, 1926. By spot welding.

1,645,724. ELECTRICAL REGULATING SYSTEM; F. W. Springer, Minneapolis, Minn. App. filed Feb. 15, 1924. A device whereby the current or voltage of the system may be regulated or adjusted within the range of the device and be automatically maintained at the desired voltage or current.

1,645,758. SUBMARINE CABLE INSULATION; A. R. Kemp, Jamaica, N. Y. App. filed Dec. 8, 1921.

1,645,810. DIRECTION FINDING AND INDICATING SYSTEM; F. A. Hubbard, West Englewood, N. J. App. filed Jan. 8, 1921. For locating the relative positions of two ships.

1,645,827. CONTROL OF POLYPHASE ELECTROMOTORS; P. H. Stevens, Northampton, Mass. App. filed Aug. 3, 1925. Used in elevator service.

1,645,860. ELECTRIC LAMP SOCKET; W. Ile, Jackson, Mich. App. filed May 6, 1926.

1,645,867. ELECTRIC HEATING UNIT; W. B. Louthan, East Liverpool, Ohio. App. filed Dec. 21, 1926.

New Trade Literature

MULTI-SPEED MOTORS.—Bulletin No. 501 issued by the Louis Allis Company, 133 Stewart Street, Milwaukee, describes its multi-speed, squirrel-cage alternating-current motors.

LINE MATERIAL.—The Line Material Company, South Milwaukee, Wis., is distributing bulletin No. 10, covering its new universal fixture, insulated hangers of various types, dead-ends, the "P6601" throttle fuse and its strain-type tilting insulator switch for pole mounting.

WELDING WIRE.—The American Steel & Wire Company, Chicago, has issued a booklet on "Premier" tested welding wire.

INSULATORS.—Catalog No. 103 issued by the Illinois Electric Porcelain Company, Macomb, Ill., covers the complete line of "Illinois" high-tension insulators and equipment.

AUTOMATIC MOTOR STARTERS — The Ward Leonard Electric Company, Mount Vernon, N. Y., has issued bulletin No. 65, describing and illustrating its inclosed automatic motor starters with main-line contactor, direct-current, counter-emf. type, with low-voltage protection and low-voltage release.

TURBO-GENERATOR UNITS. — "Direct-Connected Turbine-Generator Units" is the title of leaflet No. 2000-D issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. These units are for 125-volt and 250-volt direct-current operation. Included in the leaflet are a number of photographs showing their construction and operation.

OIL CIRCUIT BREAKERS.—Bulletin No. 11 issued by the Pacific Electric Manufacturing Company, 5815 Third Street, San Francisco, describes the Pacific oil circuit breakers and gives details of Pacific circuit-breaker controls and Pacific current transformers. A number of pages are devoted to tables and charts. Illustrations and wiring diagrams are included.

AIR COMPRESSORS, LINE CONNECTOR AND AUTOMATIC TELEMETERING EQUIPMENT. — Bulletins GEA-233A, GEA-481A and GEA-702A issued by the General Electric Company, Schenectady, N. Y., describe and illustrate respectively the centrifugal single-stage air compressors, the "GE" line connector for connecting apparatus to the line and automatic telemetering equipment.

METER SERVICE SWITCHES.—"Fuse Failure Unnecessary" is the title of an eighteen-page booklet issued by the Palmer Electric & Manufacturing Company, Waltham, Mass., discussing various engineering aspects of fuse and switch operation in air, the relation of blade and jaw design to heating and arcing, constructional features of the Underwriters' classification "AA" switches, the selection of safety switches, wiring, meter adapters and the carrrying capacity of conductors.

SWITCHING EQUIPMENT.—The Delta-Star Electric Company, 2400 Block, Fulton Street, Chicago, has issued a series of templet sheets in various scales for use of the draftsman when making layout using "Delta-Star" unit-type outdoor equipment.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Caracas, Venezuela (No. 27,899), for household electric appliances and electric signs.

Purchase is desired in Conception, Chile (No. 27,898), of incandescent lamps, electric stoves, fans, motors and wiring supplies and fixtures.

Purchase is desired in Concepcion, Chile Brunswick, Australia (No. 27,897), for electric household refrigerating units.

An agency is desired in Penang, Straits Settlements (No. 27,935), for vacuum cleaners.

An agency is desired in São Paulo, Brazil (No. 27,900), for copper wire.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Energy: A Basic Commodity

WE HAVE come to accept certain products of the earth, mineral and agricultural, like coal, iron and cotton, as basic commodities. They enter into so many things we use daily that modern life would be unthinkable without them. But, notwithstanding the recognized part played by mechanical energy in our present existence, we are still prone to give it less than its due importance as a basic constituent of practically everything we eat, wear, live in, ride in or use as a tool. Yet,

The Leading States in Value of Manufactured Products, 1925

No.	State	Value in Millions of Dollars	No.	State	Value in Millions of Dollars
1	New York	8,969	9	Indiana	2,125
2	Pennsylvania	6,902	10	Wisconsin	1,859
3	Ohio	5,348	11	Missouri	1,607
4	Illinois	5,322	12	Connecticut	1,275
5	Michigan	4,373	13	Texas	1,238
6	New Jersey	3,539	14	Minnesota	1,102
7	Massachusetts	3,427	15	North Carolina	1,050
8	California	2,443			

in the ordinary manufacturing process the tangible raw material and the invisible energy are equally essential; they are fused together in the creation of the new product.

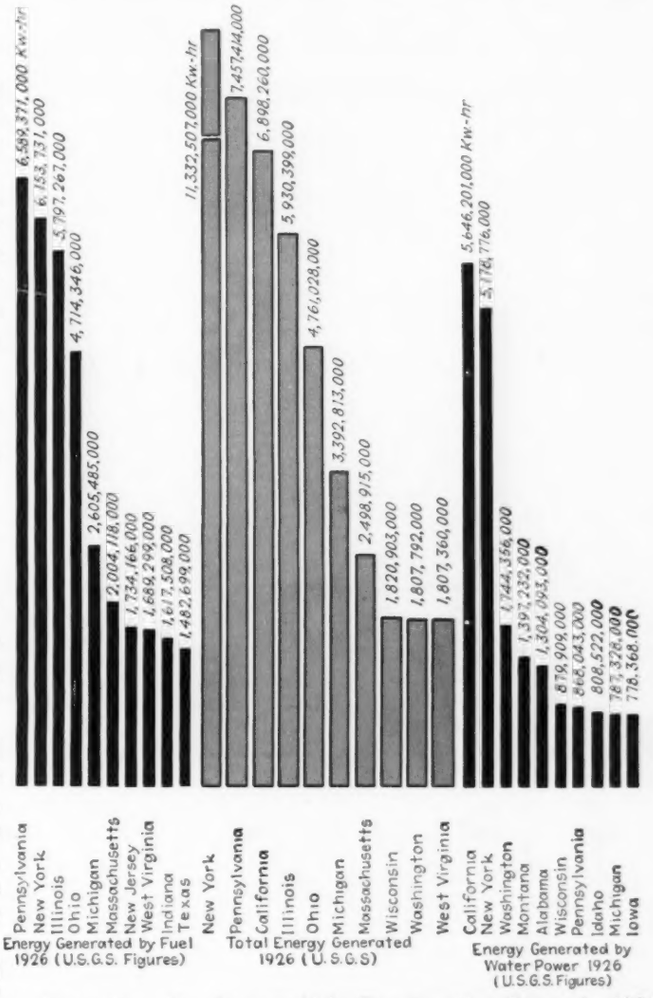
By implication we acknowledge this when we call fuel basic. But this recognizes the truth only in part. Only a fraction of our fuel goes into the production of electricity, and of the energy generated in public utility plants more than a third is produced from water power. Meanwhile three-fourths of our industrial power is electrical, using energy either generated in private plants or purchased from public utility companies.

A comparison of the list of ten leading states arranged in the order of electrical energy generated during 1926, according to data published by the United States Geological Survey, and of the leading states in value of manufactured products is suggestive in this connection. Manufacturing statistics for 1926 are not available, but those of the census of manufactures for 1926 will serve.

Of the ten states leading in the amount of energy generated, eight are among the first ten in the value of manufactured products. New Jersey and Indiana are the exceptions, but both of these states are included in the list of the first ten when arranged according to energy generated by fuel. Each group is headed by New York and Pennsylvania, and after that the similarity is close. The most striking exception is California, which uses a great deal of energy for the mineral and agricultural industries.

Arranged according to energy generated by fuel, the first five are also the first five in the table according to value of manufactured products, although in a slightly different order.

Further, the highest figures in water-power production are not much below the highest in fuel-generated



Total Kw.-Hr. Generated in Ten Leading States in 1926

energy. The water-power table further brings in some states not conspicuous for their natural resources in this regard, but none the less containing one or more great developments that help to produce an impressive total. Of the 73,791,064,000 kw.-hr. generated in the United States in 1926, New York contributed 15.3 per cent and Pennsylvania 10.1 per cent. Of the 47,602,263,000 kw.-hr. generated from fuel, Pennsylvania's share was 13.9 per cent and New York's 12.9 per cent.

In output from water power California and New York are conspicuous leaders. The total output from this source was 26,188,801,000 kw.-hr.; more than a fifth (21.5 per cent) was contributed by California and an almost equal share (19.8 per cent) by New York.

Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote or use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

Seasonal Gain in Middle Atlantic States Industrial Activity

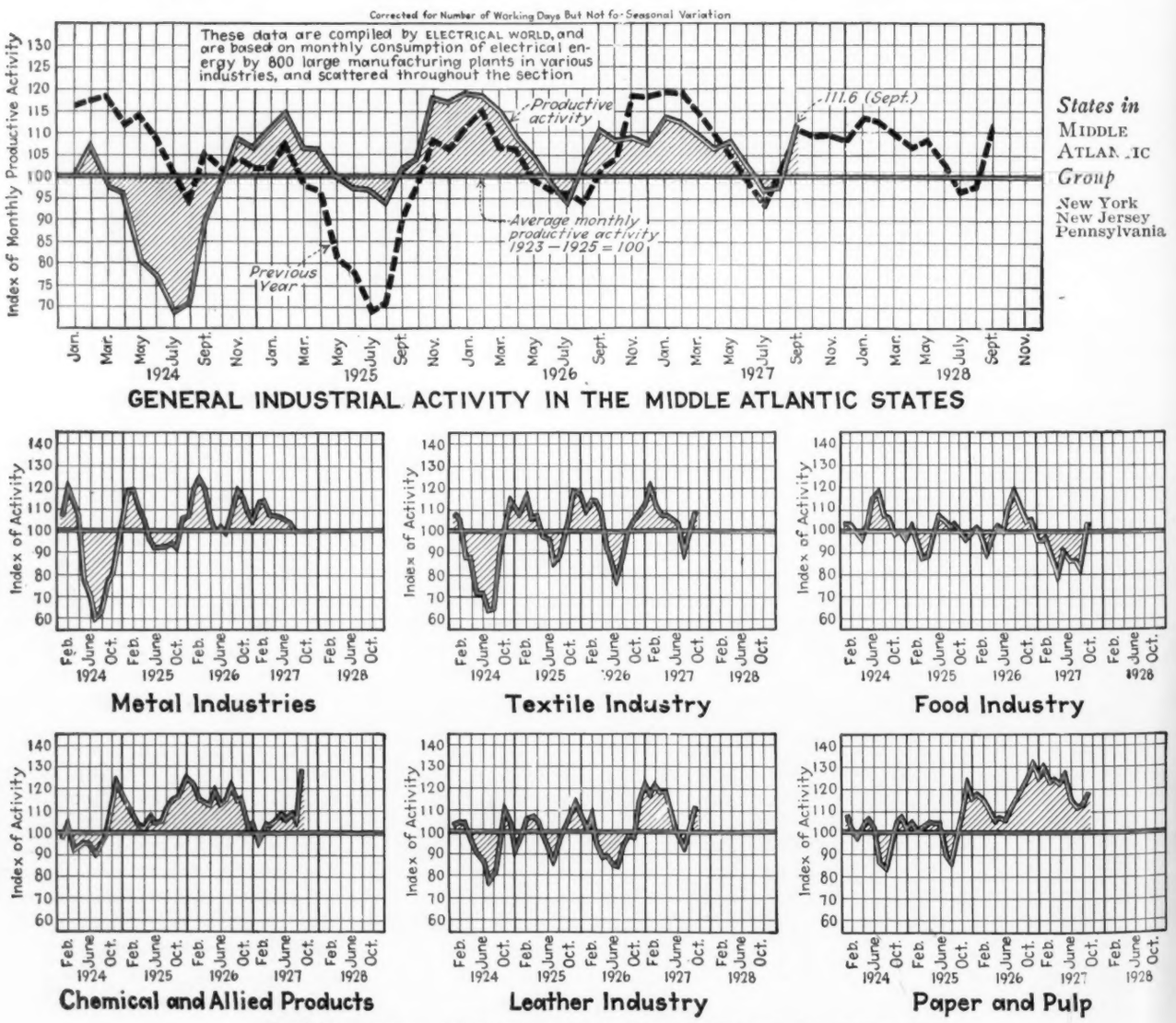
MANUFACTURING plants in the Middle Atlantic States witnessed a slightly more than normal seasonal increase in activities during September, and the productive activities of these plants were also about 0.5 per cent over those of September, 1926. It appears that industrial conditions in this section during September were slightly better than those characterizing industry in the nation as a whole.

During September four of the section's primary industries — chemicals and allied products, leather and its products, lumber and its products, and textiles—witnessed productive activities materially over those reported for September, 1926. On the other hand, five of the industrial groups — food and kindred products, rolling mills and steel plants, metal working plants, paper and pulp, and stone, clay and glass — reported activities under those of last year. It is this equalizing and stabilizing of American industry which is doing much to prolong the present period of prosperity in the nation.

Indexes of Productive Activity in the Middle Atlantic States
All Figures Adjusted for Number of Working Days

	Sept. 1927	Aug. 1927	Sept. 1926	Average for First Six Months 1927	Average for Full Year 1926
All industries	111.6	97.4	111.0	108.8	108.0
Chemical and allied products	129.3	101.5	113.8	103.9	113.9
Food and kindred products	103.3	80.3	112.8	88.5	93.6
Leather and its products	111.6	100.9	99.6	113.7	98.4
Lumber and its products	130.4	123.2	117.8	127.9	116.7
Metals group	113.3	99.4	119.4	109.3	113.8
Rolling mills and steel plants	110.7	94.1	120.2	108.9	110.9
Metal fabricating plants (ferrous and non-ferrous)	115.8	104.8	118.5	109.7	116.7
Paper and pulp	119.0	112.8	122.6	125.2	116.9
Stone, clay and glass	110.8	104.0	129.0	108.4	119.6
Textiles	109.7	97.8	100.0	109.4	101.5

ELECTRICAL WORLD *Barometer of Industrial Activity in the Middle Atlantic States*


Corrected for Number of Working Days But Not for Seasonal Variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 800 large manufacturing plants in various industries, and scattered throughout the section
Index of Monthly Productive Activity
Productive activity
111.6 (Sept.)
Average monthly productive activity 1923 — 1925 = 100
Previous Year
States in MIDDLE ATLANTIC Group
New York
New Jersey
Pennsylvania
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov.
1924 1925 1926 1927 1928
GENERAL INDUSTRIAL ACTIVITY IN THE MIDDLE ATLANTIC STATES
Index of Activity
Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct. Feb. June Oct.
1924 1925 1926 1927 1928
Metal Industries
Textile Industry
Food Industry
Chemical and Allied Products
Leather Industry
Paper and Pulp
PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE MIDDLE ATLANTIC STATES